AL.1.907
c.2

ALBERTA HERITAGE FOUNDATION FOR MEDICAL RESEARCH

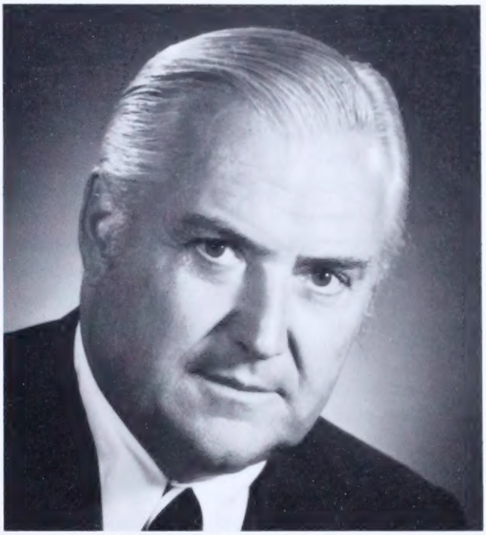
The Second Triennial Report
1983-1986

PART I

Digitized by the Internet Archive
in 2014

https://archive.org/details/reportaltaheri1986p1

Letter from the Chairman



Eric Geddes

To the Members of the Legislative Assembly of Alberta:

I take great pleasure in submitting the Second Triennial Report of the Alberta Heritage Foundation for Medical Research which, together with the report of the International Board of Review, represents a comprehensive review of the first six years of the Foundation's existence to March 31, 1986.

In each of the six years the Foundation has prepared an annual report summarizing its transactions and affairs during the preceding fiscal year and containing an audited financial statement.

Under the Act establishing the Foundation, a Triennial Report must be prepared after the end of each three-year period. This Act also requires that a report to the Foundation of an International Board of Review for the immediately preceding six-year period be included in the Triennial Report. This International Board of Review report is an integral part of the Triennial Report and is bound separately as Part II.

The report of the International Board of Review is highly supportive of the Foundation's programs of grants and awards. In the words of the report "... a remarkable milieu for medical research and research training has developed".

The Foundation is confident that further advances can be achieved by Alberta's medical research community. The completion of the Heritage Medical Research Buildings in Calgary and Edmonton will provide the setting necessary for the successful functioning of new medical research groups, working at the leading edge of medical science, and for the strengthening of existing research programs.

This impressive progress could not have been achieved without the support of many dedicated individuals and I think that it is appropriate to acknowledge our indebtedness to several groups.

The legislators of the Province of Alberta deserve the utmost credit for their wisdom and foresight in endowing, in perpetuity, a foundation for medical research. The creation of an Alberta-based foundation, on an arms-length basis, with independent decision making capability has made it possible for us to develop relationships with Alberta's medical scientific community which are particularly sensitive to and responsive to their needs.

We are very grateful for the warm cooperation and assistance provided to us by the administration and senior faculty members of our Alberta universities and their affiliated teaching hospitals. Much of the burden of evaluating and adjudicating grants and awards has fallen upon the shoulders of those who have served on our various advisory panels. The dedicated commitment shown by these individuals is reflected in the success of those scientists to whom awards have been made and whose achievements are noted in this report.

In the final analysis however, the success of this bold initiative undertaken some six years ago can only be measured by two things: the contribution to scientific progress made by the cadre of scientists put in place as the result of the Foundation's ability to provide the necessary funding; and by the creation of a dynamic environment within our universities which creates optimism and encouragement for future generations of scholars. We believe success has been achieved on both of these levels.

Our ability to continue funding high quality medical research programs based in Alberta will be a direct function of the amount of the Foundation's Endowment Fund. We must now turn our attention to the development of expenditure guidelines for the balance of this decade and beyond, recognizing the need to preserve our endowment capital at an amount which, with prudent stewardship, will preserve the integrity of the Foundation's programs in the future. We are strongly of the view that supplementation of the Endowment Fund will be required in order to maintain our programs at existing levels and allow for growth in selected areas.

On behalf of the Trustees I wish to extend our appreciation for the efforts of our President, Dr. Lionel McLeod, who has provided outstanding leadership in our first six years as well as to the dedicated staff of the Foundation who have contributed in a very meaningful way to the success achieved to date.

E.A. Geddes

Eric A. Geddes
Chairman

Table of Contents Part I

The New Frontier 4
The President's Report 6
Overview 8
Behind the Scenes 10

THE SCIENCES

The Heart of the Matter 14
Breathing Easy 18
Defeating Diabetes 21
The Search for Better Drugs 24
Nutrition and Digestion 26
Using the Body's Natural Defences 27
Diagnostic Frontiers 29
Finding the Culprit 31
Unravelling Neurological Diseases 34
Scientists of the Future 37
The Third Epoch 40
Technology Transfer 43
Meeting of Minds 46
Equipment Grants 47
New Heritage Medical Research Buildings 48

STATISTICS

Expenditures 50
Summary of Financial Statements 52
Awards Implemented 54
Programs of the Foundation 58
Personnel 61
International Board of Review (Highlights) 66

Part II

The complete International Board of Review Report. This is bound as a separate volume.

The New Frontier

Historically people in other parts of Canada have called Alberta a frontier, evoking images of the mythical rural west and in more recent decades the adventurous oil patch. In 1986 Alberta has become a new frontier, the medical research frontier. Scientists here are pioneering advances in basic science, forefront medical technology, and innovative patient care that are earning them kudos from the international scientific community.

Many of these scientists are medical researchers funded by the Alberta Heritage Foundation for Medical Research. From 1980 to 1986 the Foundation contributed $144 million directly to the scientific community to support 109 independent research positions, train 2100 students, and provide equipment to 275 laboratories.

Some of the well-established scientists supported by the Foundation are recognized as international authorities on: the heredity of cancer, persistant viruses and neurological diseases. The U of C cardiac research group is pioneering ways to diagnose heart disease and prevent sudden cardiac death. The U of A Nuclear Magnetic Resonance research group is one of a handful in the world that uses this new technology to diagnose and monitor cancer and stroke damage. Other younger scientists are charting new territory in Canadian research with innovative studies of problems such as autism, ligament injury, and sour gas injury.

Frontiers have always attracted the daring, young people looking for adventure and Alberta's medical frontier is no exception. One of the most satisfying aspects of Foundation activity has been the large number of bright young people attracted to medical research.

Establishing the Foundation was a bold venture — to create a large medical research community with world class standards that would contribute to improved health care. Six years later it is still a bold venture because a significant cadre of scientists are working on the forefront of medical research. It is a venture which is succeeding.

Dr. David Matheson with
Thomas Garlepp.

The President's Report

The Second Triennial Report (1983-1986) is a major milestone in the Foundation's quest for medical research achievement in our province. The document summarizes the activities of the Foundation and includes, in Part II, the report of the first International Board of Review. As required by the Foundation's Act, this board of distinguished scientists completed an in-depth study of the Foundation's activities during the first six years.

The International Board of Review found that the Foundation has had a remarkable and highly favorable impact on the quality and importance of Alberta's medical research. Both experienced, highly qualified scientists and young well-trained scientists with great potential have been attracted to Alberta. Research training programs are enlisting bright young people who, on completion of their training, are entering successful research careers. Most importantly, the Board noted the high morale, enthusiasm and vigor of our research milieu and that the scientists acquire substantial external operating research funds despite the present very competitive environment.

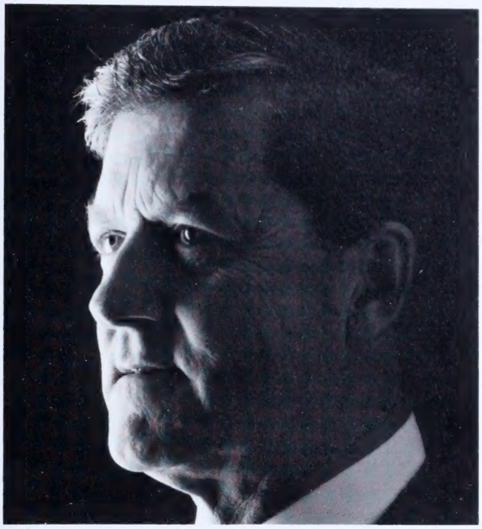
Alberta's medical research has national and international recognition. In many instances, our medical research is on the leading edge of world efforts to better understand the mechanisms of disease for prevention, earlier recognition and management.

The Board called attention to a concern common to research institutions and agencies. High levels of continuing research productivity requires that vigor and enthusiasm be maintained. To achieve this, it will be necessary to add, at regular intervals, new, young, well-trained scientists to the research establishment. The well-populated training programs will serve as an important recruitment resource. Flexibility in the use of the Foundation's funds, the continuation of regular reviews of progress and strong commitment from the Foundation, the universities and the scientific community will be necessary if this concern is to be addressed satisfactorily.

The Second Triennial Report highlights progress in clustering independent medical scientists about common research objectives. Fostering multidisciplinary research is a major objective. The new laboratory buildings in Edmonton and Calgary facilitate this. New uncommitted space will allow the creation of new groups of scientists and encourage more efficient use of high cost technology. The proximity of the buildings to major teaching hospitals will help link basic research to basic care and will lead to earlier recognition of new ideas with commercial potential. These buildings will provide important physical reserves for future programs of medical research.

Over the past 20 years, Canada has had a shortage of medical specialists who are adequately qualified to do competitively-funded research. This shortage affects the quality of medical education and the application of new basic knowledge to patient care. The Foundation implemented two programs to address the problem: the Clinical Fellowship Training program and the Clinical Investigatorship program for medical graduates who have some research training but need further assistance to successfully enter a research career. With further opportunity for training and protected time for research, clinicians should become firmly established as productive scientists. Candidates for training have been welcomed in prestigious research centres and most then move on to career positions. Both programs continue to grow in numbers and quality, and will provide future leaders in academic medical departments in Alberta and across the country.

In 1985, the Trustees developed the Technology Transfer program to fund, on a competitive



Dr. Lionel McLeod

basis, the development of medical research innovations with commercial potential. The program was based on a careful review of similar programs and an inventory of opportunity compiled by The University of Alberta and The University of Calgary. To be eligible for a grant, the innovations must come from within Alberta's universities or private companies. The first competition resulted in a number of awards and some have begun attracting interest from investors. This important program is being monitored for both its ultimate commercial benefits and impact on university-industrial relations.

The past three years have been years of significant achievement. Credit must go to the continuing strong support of the Trustees of the Foundation and the outstanding efforts of our administrative staff who have managed increasing responsibility with efficiency. The remarkable generosity of many Alberta scientists and scientists from across the world has permitted careful evaluation of the many applications received. This assistance has been, and will remain, essential to the ultimate quality of the medical research supported by the Foundation. I wish to offer my deep appreciation to the Trustees, our staff and these many scientists; appreciation I know is shared by Alberta's medical research community.

L.E. McLeod, M.D.
President

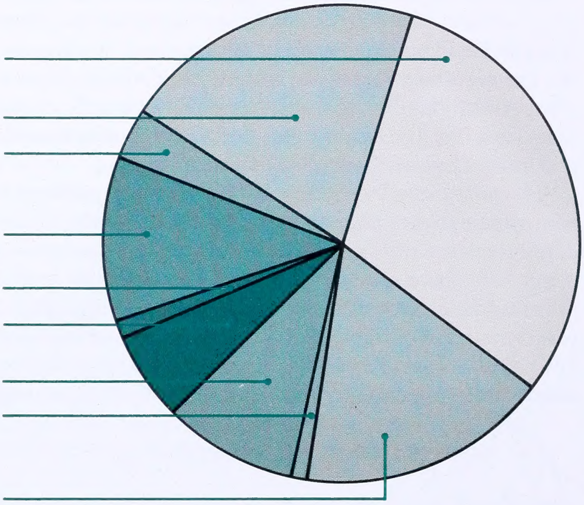
An Overview

In November 1979 an Act of Legislature created the Alberta Heritage Foundation for Medical Research to establish and support a balanced, long-term program of medical research based in Alberta. Foundation activities are directed toward the discovery of new knowledge and the application of that new knowledge to improve health care of Albertans and all people.

To build a balanced program, the Foundation supports basic and clinical scientists, both well-established people and young people beginning new research careers. Investigators explore a broad spectrum of disciplines such as: biochemistry, microbiology, pediatrics, immunology, neurology, dentistry, pharmacology and many others.

The Foundation is supported by a $300 million endowment fund and its investment earnings. The Foundation stands at arm's length from the government under the management of a group of distinguished Trustees.

AHFMR Expenditures
April 1 1983 - March 31 1986 **Total $108.17 M**



Scholarship/Heritage Medical Scientist Awards, Clinical Investigators, Establishment Grants	$32.62 M
Fellowship Awards and Research Allowances	$21.48 M
Administrative Costs	$3.24 M
Major Equipment Grants and Maintenance (excluding Establishment Grants)	$12.58 M
Scientific Policy and Evaluation Costs	$0.81 M
General Research Grants*	$6.74 M
Studentship Awards and Research Allowances	$10.83 M
Technology Transfer Grants	$0.05 M
Research Support Costs and Institutional Grants to Universities**	$19.82 M

* Conference Grants, Visiting Scientists, Visiting Lecturers and Faculty Travel, Independent Establishment Grants, Independent Research Allowances, Special Initiative Funding, Visiting Professorships and Clinical Traineeships.

** Includes Institutional Grants for planning and construction of new research buildings.

For a graph of expenditures for each of the three years and a summary of financial statements see page 52.

Awards and Grants

The main activity of the Foundation is an awards and grants program designed to establish a critical mass of career scientists in Alberta. The program includes:

- Heritage Medical Scientist, Heritage Medical Scholarship, and Clinical Investigatorship Awards.
- Studentships (full-time, part-time, and summer)
- Fellowships (full-time, part-time, and clinical)
- Establishment Grants for New Investigators

- Grants for Major Equipment
- Grants for Equipment Maintenance
- Visiting Scientists to Alberta
- Visiting Scientists from Alberta
- Visiting Lecturers
- Visiting Professors
- Travel Grants
- Grants for Conference Support & Workshops
- Technology Transfer Grants
- Clinical Traineeships

Much of the Foundation's work is carried out on the advice of a Scientific Advisory Council with 13 members who represent the national and international medical scientific communities.

The Council and its committees review and advise the Foundation on applications for loans, grants, research projects and professorships.

Trustees

Eric A. Geddes, F.C.A., Edmonton, Chairman
William Daniel Dickie, Q.C., Calgary, Vice-Chairman
Robert Robertson Francis, M.D., Edmonton
Myer Horowitz, Ed.D., President, The University of Alberta
N. Patrick Lawrence, Q.C., Red Deer
LeRoy Harding le Riche, M.B., Ch.B., Registrar, College of Physicians and Surgeons of Alberta
The Hon. Mr. Justice Michael Brien O'Byrne, Court of Queen's Bench, Alberta
Gordon Cummings Swann, D.D.S., Calgary
Norman Ernest Wagner, Ph.D., President, The University of Calgary

Officers

President: Lionel E. McLeod, M.D.
Financial Officer: Alex J. Nykolyn, C.A.

Scientific Advisory Council

Dr. Lionel E. McLeod, President, Alberta Heritage Foundation for Medical Research
Dr. Lawrence E. Bryan, Professor and Head, Department of Microbiology and Infectious Diseases, Faculty of Medicine, University of Calgary, Calgary, Alberta
Dr. John S. Colter, Professor and Chairman, Department of Biochemistry, Faculty of Medicine, University of Alberta, Edmonton, Alberta
Sir Alastair Currie, Professor of Pathology, Edinburgh University, and Pathologist — Royal Infirmary of Edinburgh, Scotland
Dr. David M. Kipnis, Busch Professor of Medicine, Chairman, Department of Medicine, Washington University School of Medicine, St. Louis, Missouri
Dr. Robert G. Lee, Professor and Head, Department of Clinical Neurosciences, Foothills Hospital, Calgary, Alberta
Dr. James V. Maloney, Jr., Louis D. Beaumont Professor of Surgery and Associate Dean, Department of Surgery, UCLA School of Medicine, Center for the Health Sciences, Los Angeles, California
Dr. Joseph B. Martin, Bullard Professor of Neurology, Harvard Medical School and Chief of Neurological Services, Massachusetts General Hospital, Boston, Massachusetts
Dr. Antony H. Melcher, Professor of Dentistry; and Associate Dean, Life Sciences, School of Graduate Studies, Faculty of Dentistry, University of Toronto, Toronto, Ontario
Dr. Aser Rothstein, Professor of Medical Biophysics, Director of Medical Research Institute, The Hospital for Sick Children, Toronto, Ontario
Dr. David L. Sackett, Professor, Departments of Clinical Epidemiology and Biostatistics and Medicine, McMaster University, Hamilton, Ontario
Dr. René Simard, Vice-rector for Studies, Universite de Montreal, Montreal, Quebec
Dr. David L. Tyrrell, Director, Department of Medical Microbiology and Infectious Diseases, University of Alberta, Edmonton, Alberta

Former Members of the Scientific Advisory Council

Dr. Ernest E. McCoy, Professor, Department of Pediatrics, Faculty of Medicine, University of Alberta, Edmonton, Alberta (1982-1985)
Dr. Robert E. Moyers, Center for Human Growth and Development, Ann Arbor, Michigan (1982-1985)
Dr. Warren L. Veale, Professor and Head, Department of Medical Physiology, Faculty of Medicine, University of Calgary, Calgary, Alberta (1982-1985)
Dr. George J. Drummond, Killam Professor of Biochemistry, Departments of Chemistry and Medical Biochemistry, Faculties of Science and Medicine, University of Calgary, Calgary, Alberta (1982-1984) (deceased)

Behind the Scenes

An interview with Dr. Lionel McLeod, President of the Foundation, since the position was created in 1981.

Does the Foundation really operate independently of the government of Alberta?

DR. McLEOD: Yes, by statute, it is at arm's length. It has made its own decisions for the entire period of my Presidency. Indeed, it has not at any time been pressured to move in a particular direction. However, everyone is conscious of the fact that the government, like the person on the street, would welcome some measurable, public, and easily identifiable benefit from the research.

Is there some easy identifiable benefit from the Foundation? How do we know we are getting our money's worth?

DR. McLEOD: There are two facets to that. One is that you really have identifiable high quality scientists in the province doing research and attracting attention from all over the world, and number two, you have easily identifiable programs of patient care generated by some of these same scientists.

Can you give some examples?

DR. McLEOD: Two. One is patient care programs dealing with disturbances of heart rhythms provided by Calgary investigators. Secondly, the most advanced imaging technology — nuclear magnetic resonance — is available at The University of Alberta through a program headed by Dr. Peter Allen, a physicist and Heritage Medical Scientist.

You mentioned that the scientists are attracting attention from all over the world. You now have 109 established scientists. When the Foundation was initiated sceptics didn't believe people could be attracted to Alberta which is very far away from McGill, Harvard, and NIH in Maryland. How were they attracted?

DR. McLEOD: The major attraction was the opportunity for scientists to become quickly established and have access to new technology. The Foundation has funds to support scientists at levels that allow them to achieve a high degree of productivity very quickly. We frequently grant a new Scholar well over a hundred thousand dollars to set up a new lab with the most advanced laboratory equipment. I think that was a major reason. This opportunity is hard to find elsewhere in North America at this time.

You have just completed your first renewal process for scholars completing their initial five year award. What did you find?

DR. McLEOD: Well, reviewers agreed that the majority had accomplished significant and important research that met the standards of scientific excellence established by the Foundation.

Were some scholars not renewed?

DR. McLEOD: Yes, a small number of awards were not renewed and some scientists and their colleagues were very disappointed.

You've also had your first review by the newly appointed International Board of Review. Were there any surprises in the report?

DR. McLEOD: In the sense of brand new issues, no, but there were some of importance. The Board focussed heavily on an age old question, "How do you maintain the vigour and the vitality of this pool of scientists over five, ten, twenty years?" That really wasn't a surprise because it has been a problem for years in universities and medical schools! They continue to struggle with this difficult issue.

One of their recommendations was to continue, if not increase, the level of basic research as opposed to patient care studies. It is very difficult for most Albertans to appreciate the value of studying calcium transport when they see so many urgent patient care issues such as the need for improved geriatric and palliative care. How do you answer this concern?

DR. McLEOD: There are two ways of looking at that question — a very good question. One answer is that patient care programs do require some research, but in fact, a great deal is known about what could or should be done. More research may not necessarily be the main need.

Research into present day programs is important but is more clearly the responsibility of those operating and funding the programs. Nevertheless, the Foundation is examining ways to encourage well organized clinical trials.

When you say "the responsibility of those operating the program", do you mean hospitals?

DR. McLEOD: Hospitals, government, the professions. On the other hand, the Trustees and of course, the scientific community at large, believe very strongly (based upon the history of science, especially in the last 20-50 years) that prevention and specific interventions will come from a better understanding of the mechanisms of disease. If those mechanisms can be elucidated, then new programs can be designed. That is why the International Board of Review has encouraged basic research.

A minute ago you said a great deal is known about what could and should be done. Does that mean we already have a whole pool of knowledge that isn't being implemented into health care?

DR. McLEOD: In part, yes. There is a great deal of experience and information that does need evaluation but we need better ways to evaluate and implement results. That is not an easy task.

Can you give me an example of something we know about that we just haven't done anything about?

DR. McLEOD: Perhaps the role of the outpatient departments in diagnosis and treatment compared to the use of inpatient facilities. Great variation between communities and institutions exists. Some hospitals have efficiently applied new information about this and others have not.

Do we need a Foundation that is parallel or adjunct to this one, to look at those aspects of health care?

DR. McLEOD: Not necessarily! We need, in our patient care institutions, scientists well-trained in the science of evaluation.

Would the Foundation ever fund that sort of evaluation activity?

DR. McLEOD: Yes, we would and do through our training programs. However, we expect other agencies to provide regular operating grants for all research activities, including evaluation. Secondly the Foundation encourages clinical research which always incorporates evaluation of medical care.

For most of us, medical research means cures, at least that's what we hope it means, but what can Albertans realistically expect from the scientists the Foundation has put into place, say in the next five or ten years?

DR. McLEOD: Scientific discovery does not unfortunately lend itself to timetables. We don't know when one or more of our researchers will open a pathway that leads directly to the heart of a question and its answer. On the other hand, as the number of scientists grow and especially as they work in collaborating groups, I believe the opportunities will increase quickly. It's just as possible that some of the new findings of these people will turn on a light elsewhere in the world with the breakthrough tracking back to the Alberta scientist's contribution.

As happened in the last five years, I do believe in the next five years, patient care programs will be increasingly sophisticated and effective as a result of the influx of scientists to Alberta.

In what areas do Alberta researchers lead?

DR. McLEOD: Diseases of the nervous system, viral and bacterial infections, disorders of the pumping mechanism of the heart are good examples.

You have an innovative program that is designed to facilitate the transfer of knowledge from the laboratory to the marketplace — the Technology Transfer program. How did you develop it and how do you decide who is funded?

DR. McLEOD: The program is designed to facilitate the transfer of new knowledge to commercial products. For some time we felt we lacked arrangements that might encourage scientists to think along lines that lead to commercialization. It is important to give scientists an incentive to ask: "Is this a possibility? Does this finding have a commercial application?" Secondly, every part of our country wishes to diversify its economy. The Foundation funds a large number of first-class scientists who could contribute to economic development in Alberta.

The Trustees spent considerable time exploring ways to accomplish this. We were impressed by the program of the National Institutes of Health in the United States and consulted with them in designing our program. Applications are approved or rejected by a committee of scientists, business people, and Trustees.

What are some of the difficulties that the Foundation encountered during the last six years?

DR. McLEOD: The most noteworthy example would be the need for useful amounts of space for multidisciplinary groups. If groups of collaborating scientists were to be created, more open laboratory space was essential. That factor led to the decision, after consultation with the Government, to use some of the unexpended retained interest from the endowment to fund the construction of new medical research buildings at The University of Alberta and The University of Calgary.

What are some of the more satisfying aspects or accomplishments during the last six years?

DR. McLEOD: The number of able young people who are gaining excellent research training is probably one of the most satisfying aspects of the Foundation's activities. Before the Foundation existed, we, in Alberta, seemed to be constantly spinning our wheels. We couldn't gain the momentum required to compete with the larger centres in other parts of North America. The Foundation gives the university community the opportunity to build a research community of young people. For the scientist at the laboratory bench, the influx of new people is probably the most exciting and satisfying feature.

Is the endowment and the interest it generates adequate to fund the Foundation's activities in the future?

DR. McLEOD: It was our expectation that at a critical point in time the Foundation's endowment would be increased. That expectation allowed us to provide funds for the new buildings. The downturn in the Alberta economy is such that a timetable for an increase is uncertain. The growth of our scientific community may be delayed but I hope not to the extent that the very favorable momentum is slowed.

What directions will the Foundation take in the next six years?

DR. McLEOD: The main task is to recruit groups of collaborating scientists — to attract the very finest people we and the universities can find and to efficiently place them in the new buildings at the most reasonable cost. The second most important task goes back to the question of clinical trials. We must encourage the development of expertise in critical trials and in evaluating new technology.

The Sciences

The Heart of the Matter

Heart disease is still the number one killer in North America. Half the fatalities are caused by sudden cardiac death. Researchers at the U of C are identifying more effective ways to treat heart attacks and pioneering ways to prevent them by identifying people at high risk.

The Calgary team covers the whole spectrum of cardiac research from basic studies of the single cell to clinical studies of patients. Improved patient care is based on molecular biology studies on the initial causes of heart attacks and on drug effectiveness at the cellular level. Members of the U of C cardiac research group who are not Heritage Medical Scholars are supported by key equipment grants and AHFMR students and fellows.

Dr. Witkowski's innovative work at the U of A adds to the strength of cardiac research in the province.

What is the role of cardiac muscle contraction in heart disease?

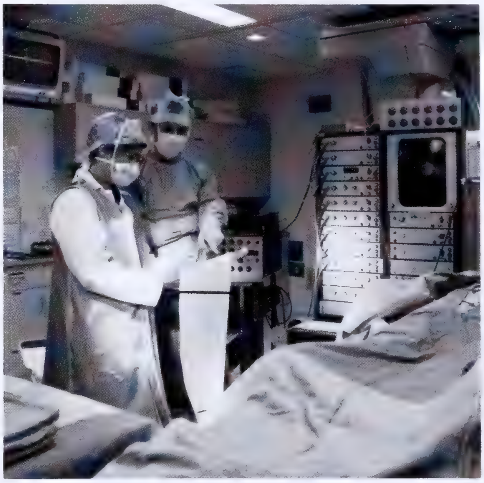
Dr. Henk ter Keurs, Heritage Medical Scientist, U of C

Dr. ter Keurs investigates the mechanical properties of the cardiac cell and the regulation of contraction to better understand diseases in which the heart's pumping action is abnormal. His work focuses on how heart rate and drugs affect the calcium balance of cells. An MD and PhD, Dr. ter Keurs' clinical research includes studies of the enlarged heart, sometimes called the athlete's heart, and studies to determine how drugs and hormones affect muscle contraction. His work bridges Dr. Tyberg's muscle physiology studies and Dr. Giles' electrophysiological studies.

What factors affect the heart's pumping action?

Dr. John Tyberg, Heritage Medical Scholar, U of C

Dr. Tyberg is investigating cardiac mechanics, particularly the effects of pressure exerted by the pericardium, the sac around the heart. He has demonstrated that the effect of the pericardium cannot accurately be measured by a conventional open catheter, the method commonly used by physicians. This has important implications for the treatment of heart failure patients.



How do electrical currents generate pacemaker potential and action potential in cardiac cells?

Dr. Wayne Giles, Heritage Medical Scholar, U of C

Very small ionic currents are believed to control the heart's ability to beat spontaneously and pump blood. Dr. Giles has helped pioneer a way to study these currents at the level of a single heart cell using a technique called the voltage clamp method. He uses the same technique to study specific changes caused by antiarrhythmic drugs and calcium channel blockers used to treat heart disease.

Dr. George
Wyse

How can we diagnose people at high risk for heart attacks?

Dr. Eldon Smith, Head of Cardiology, U of C (Major Equipment Grant)

Funded by an AHFMR equipment grant, Dr. Smith and colleagues have devised one of the few Body Surface Mapping Systems in North America. Whereas conventional ECG equipment records heart activity at 19 body sites, the new mapping system records activity at 120 body sites and can produce a contour map of a single heart beat. This makes it an important tool for identifying people with abnormal heart rhythms who may be at risk for a heart attack and for assessing the effect of drugs on that risk.

Which drugs are most effective in treating arrhythmias?

Dr. Henry Duff, Heritage Medical Scholar, U of C

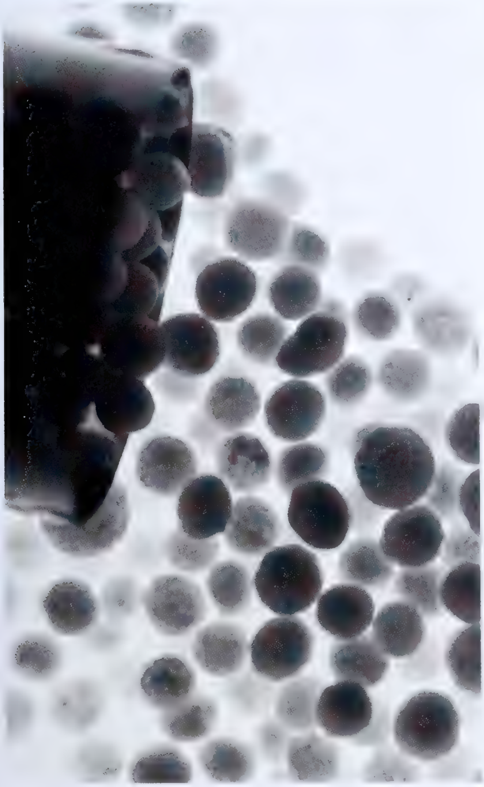
One of the signs of a potential heart attack are irregular, life-threatening rhythms of the heart called arrhythmias. Dr. Duff evaluates known drugs, develops new ones, and uses drugs as probes to further understand the basic physiology of the heart. (see In Search of New Drugs p. 24).

How does the autonomic nervous system contribute to arrhythmias?

Dr. Frank Witkowski, Heritage Medical Scholar, U of A

A physician and engineer, Dr. Witkowski has devised an automated cardiac mapping system which yields previously unavailable information from the heart muscle wall. The equipment is invaluable during certain types of surgery because the surgeon can diagnose a condition called supraventricular tachycardia with a single heart beat.

Dr. Witkowski uses the equipment in basic research to study how the autonomic nervous system influences whether or not life-threatening rhythms occur with a heart attack or with sudden flow restoration after coronary artery blockage.



PATIENT CARE

How can drug testing for life-threatening arrhythmias be improved?

Dr. George Wyse, Heritage Medical Scholar, U of C

When a patient has certain life-threatening heart rhythms called arrhythmias, he or she is at high risk for cardiac arrest. Dr. Wyse treats such high risk patients to prevent heart attacks. He induces an episode of arrhythmias with electrodes for a short time under carefully controlled conditions. This allows him to test various drugs and identify those which most effectively control the arrhythmias. Though the procedure is risky, after three years of clinical trials, Wyse has found patients with ventricular tachycardia and fibrillation are more likely to survive with this treatment than without it.

Dr. Wyse is developing a computer-assisted method of measuring the heart's internal electrical activity which he anticipates will reliably predict which medicines will control arrhythmias. This would eliminate the need to actually induce tachycardia or fibrillation. In studies of isolated human arteries, he is investigating how hormones and neurotransmitters may help regulate high blood pressure.■

Breathing Easy

Heritage scientists investigate lung problems ranging from occupational lung disease to a common and sometimes fatal sleep disorder.

Dr. John Remmers

How does the work place cause lung disease?

Dr. Francis Green, Heritage Medical Scholar, U of C

Alberta farmers breathing in grain dust, petrochemical workers exposed to toxicants, and construction workers surrounded by dust, are all potential victims of lung diseases that lie dormant for 20 years, then rise to kill. Dr. Green, a specialist in occupational lung disease, is helping to build a strong group of environmental researchers in the province.

Dr. Green analyzes lung samples from all over Canada for toxicants (uranium dust, grain dust, diesel fuels, etc) and for the presence of diseases such as emphysema and lung cancer. He also uses animal models to test pulmonary lavage (washing the lungs) as a cure for lung disease. Presently no cure exists.

How can diseased lungs be cleared?

Dr. Malcolm King, Heritage Medical Scholar, U of A

A mechanized variation of the old-style artificial respiration may give relief to cystic fibrosis and emphysema patients. Dr. King is investigating the technique as one aspect of his basic and clinical studies on mucus clearance in lung disease.

What is the role of lung cell surfaces in disease?

Dr. Samuel Schürch, Heritage Medical Scholar, U of C

Dr. Schürch uses his expertise in biophysics to precisely measure how lung cells interact with their surrounding surfaces and how the surface of lung lining can contribute to disease.

What are the effects of H_2S Gas?

Dr. William Hulbert, Heritage Medical Scholar, U of A

Dr. Hulbert uses an animal model to study airway injury caused by sour gas. He assesses how breathing H_2S affects the cellular structure of the airway passage and lungs. Studies include the mechanics of the H_2S knockdown when exposure causes unconsciousness, results of graded doses of gas, and the dynamics of repair following injury.

PATIENT CARE

How can sleep apnea be treated?

Dr. John Remmers, Heritage Medical Scientist, U of C

Dr. John Remmers was the first person to identify a common breathing disorder called sleep apnea. Apnea blocks the air passage so that the sleeper is unable to breath. Affecting about two percent of the population, apnea patients suffer social and medical consequences including daytime sleepiness, depression, and occasionally heart failure. Excessive snoring is one symptom.

Remmers has a long list of patients waiting to be treated in his sleep lab. Plagued snorers from across Canada write to him for relief from their problems, ranging from daytime drowsiness on the job to marital disharmony. Remmers has developed a sleeping mask that is a nasal airway positive pressure system which eliminates the airway blockage. His latest design is superior to the only other system available in North America and is now being refined with the support of a Foundation Technology Transfer Grant.

Remmers expects work on sleep apnea will elucidate some of the unidentified sleeping problems of the elderly and will also increase knowledge about crib death.

Dr. John Maloney

What is the pathology of *pseudomonas* infection?

Drs. Pamela Sokol and Donald Woods, Heritage Medical Scholars, U of C

Drs. Sokol and Woods investigate the pathology of *pseudomonas aeruginosa,* a microorganism that causes a number of serious infections, including a chronic lung infection that afflicts the majority of cystic fibrosis patients.

What controls breathing before birth?

Dr. John Maloney, Heritage Medical Scientist, U of C

Dr. Maloney heads a research group concerned with cardiorespiratory problems of the unborn and newborn infant. He investigates a variety of lung and cardiac dynamics using new ultrasound techniques. For example, he is pioneering a way to image the blood flow in the placenta which will guide physicians in making choices such as whether a caeserean section is necessary or not for hypertensive mothers. Other studies of the control of breathing before birth are relevant to crib death and the need for support systems for premature infants.■

Defeating Diabetes

Enthusiastic scientists around the world agree they are on the edge of defeating diabetes and Canadian researchers are in the forefront. Taking insulin controls diabetes with varying success. It does not cure the disease or prevent the possibility of blindness, heart disease, and other complications. However recent advances in immunology, virology and genetics offer new hope for reversing diabetes and perhaps even preventing it.

Do viruses contribute to diabetes?

Dr. Ji-Won Yoon, Heritage Medical Scientist, U of C

Dr. Yoon is the first scientist to show direct evidence that viruses are capable of causing some diabetes in people. He suspects there are two types of viruses involved, one that directly attacks the pancreatic cells and another persistent virus that triggers autoimmunity (where the body attacks its own pancreatic cells) in people who are genetically susceptible. In 1982 Dr. Yoon made headlines because he developed a vaccine against a particular EMC virus that prevented diabetes up to 100% in immunized mice. With more basic research on animals and human tissue specimens, Yoon is confident he will eventually develop a vaccine to effectively immunize people at high risk for insulin dependent diabetes.

Can we identify who is genetically predisposed to diabetes?

Dr. Leigh Field, Heritage Medical Scholar, U of C.

Dr. Field uses recombinant DNA techniques to analyze variations in the genetic information of diabetics, compared to non-diabetics. She has new evidence to suggest that three particular genes on chromosomes 14, 2, and 11 are involved, in addition to two genes that have been implicated for some time.

How does the immune system fail in diabetes?

Dr. Bhagirath Singh, Heritage Medical Scholar, U of A

In order to understand diabetes as an autoimmune disease, Dr. Singh investigates the way T-lymphocytes "recognize" foreign or self material before destroying cells. He has devised a monoclonal antibody against the proteins encoded by the immune response genes which can block the generation of diabetes in mice.

How do genetic susceptibility and autoimmunity cause diabetes?

Dr. Martine Jaworski, Heritage Medical Scholar, U of A.

To study the disease process, Dr. Jaworski compares the immune systems of diabetics, their close relatives, and healthy, unrelated individuals. In animal studies, she investigates the effects of cyclosporin, an immunosuppressive drug that can reverse diabetes in animals.

What mechanisms control insulin secretion?

Dr. Reinhart Reithmeier, Heritage Medical Scholar, U of A.

Dr. Reithmeier investigates the structure and function of membrane proteins in three systems involving specific plasma, skeletal-muscle, and pancreatic cells. His work includes characterizing the protein components of the signal recognition particle in insulin secretion.

PATIENT CARE

Is gestational diabetes a clue to the disease?

Dr. Edmond Ryan, Heritage Clinical Investigator, U of A.

Three percent of pregnant women develop gestational diabetes and though it disappears after the birth, half will develop diabetes later in life. Dr. Edmond Ryan investigates glucose transport and hormonal influences in gestational diabetes to better understand the disease in general. As a clinician he spends part of his time caring for diabetics at the U of A Hospital.

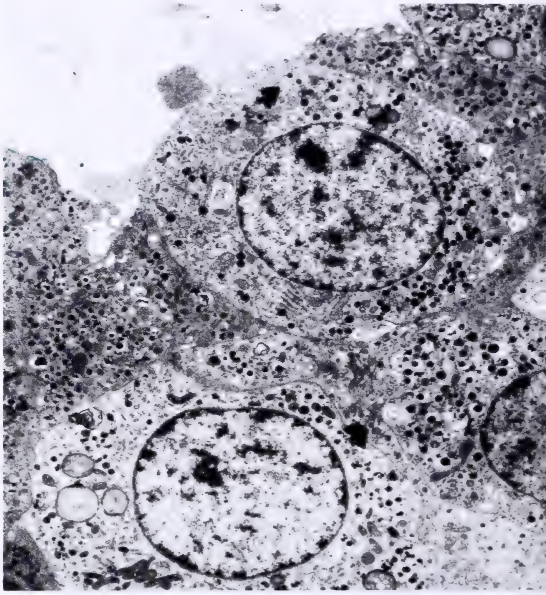
How is obesity related to diabetes?

Dr. David Lau, Heritage Medical Scholar, U of C.

Dr. David Lau examines the molecular mechanisms that regulate adipose (fat) tissue growth which appears to be dependent upon a network of capillaries. He has evidence that there are hormone-like substances called growth factors involved and is pursuing this by comparing adipose tissue from diabetic, obese, and healthy persons. This work is related to a complication of diabetes called retinopathy which may cause blindness.

Dr. Lau shares his clinical expertise with physicians and patients at the Foothills Hospital. He is founding Director of the Foothills Hospital Outpatient Lipidemia and Weight Control Clinic. The clinic offers patients a 12-week multidisciplinary program for weight loss.

Dr. Garth Warnock



Will cell transplantation cure diabetes?

Dr. Garth Warnock, Heritage Clinical Investigator, U of A.

One of the most hopeful experimental treatments for diabetics is transplanting pancreatic islet cells to give the patient new insulin-producing cells. Initial attempts in the United States have been partially successful. Dr. Warnock is studying two of the problems associated with the procedure: finding a way to harvest adequate numbers of islets from the donor pancreas, and preventing rejection.

He predicts islet cell transplantation will be available to Albertans in two or three years, when the procedures have been further refined. Meanwhile, another U of A surgeon, Dr. Norman Kneteman, has an AHFMR Fellowship to acquire further training in the surgical transplantation techniques from the researchers who pioneered them at Washington University in St. Louis.

When not in the lab, Dr. Warnock does specialized surgery at the Edmonton General Hospital. ■

uab
-RUSH-
HUMAN PANCREAS
FOR
ISLET
TRANSPLANT

The Search for Better Drugs

So strong is our association with drugs, we sometimes equate taking medicine with health care. That's understandable because, at some point, many of us owe our life to drugs.

Like all facets of medical research, advances in molecular biology have changed the nature of drug research and opened up new possibilities. A few Foundation scientists directly investigate drug effectiveness, but the majority conduct basic cellular studies to see how the healthy and the diseased body respond to natural compounds. Some studies focus on drugs commonly used because they are at least partially effective though scientists don't understand why. All these studies provide a rational basis for developing more effective drugs.

For brevity and simplicity in some cases only the general research question is given, with no added description of the investigations.

How can more effective antibiotics be produced less expensively?

Dr. Susan Jensen, Heritage Medical Scholar, U of A

Dr. Jensen and two colleagues have developed a method for producing cheaper and more potent antibiotics. Making antibiotics can take years, even decades, but in Jensen's lab it can take as little as half an hour. This will cut production costs dramatically.

Dr. Jensen uses sound waves to break open cells and extract enzymes that trigger penicillin and cephalosporin antibiotics in fungi and bacteria. These enzymes are then applied to natural and synthetically modified substrates (starting materials).

Dr. Jensen and her colleagues, Dr. Donald Westlake at the U of A and Dr. Saul Wolfe at Queens University, have used the new method to produce a handful of new antibiotics that are being further tested by pharmaceutical firms.

What regulates the transport of agents called nucleosides which are used to treat viral disease and various cancers?

Dr. Simon Jarvis, Heritage Medical Scholar, U of A

How do natural brain chemicals called trace amines affect antidepressant drug action?

Dr. Andrew Greenshaw, Heritage Medical Scholar, U of A

How can antidepressants containing enzyme inhibitors be more selectively targeted and therefore more potent, with fewer side effects?

Dr. Monica Palcic, Heritage Medical Scholar, U of A

How does the epilepsy drug, phenytoin, alter the mechanisms that regulate neuron excitability?

Dr. Fred Quandt, Heritage Medical Scholar, U of C

How do anticonvulsives and antihypertensives and other drugs bind to target molecules?

Dr. Penelope Codding, Heritage Medical Scholar, U of C

How does antibiotic resistance develop in organisms such as *Campylobacter*, a bacteria which causes a number of infections including blood poisoning?

Dr. Diane Taylor, Heritage Medical Scholar, U of A

PATIENT CARE

What are the mechanisms of drug action for cardiac drugs?

Dr. Henry Duff, Heritage Medical Scholar, U of C

Dr. Henry Duff investigates precisely how antiarrhythmic drugs used to control abnormal heart rhythms affect heart action. For example, he has studied mexiline and quinidine and found that a combination of the two is most effective. In studies such as this, Duff evaluates known drugs and pursues new ones. Dr. Duff works closely with cardiac physicians looking for the best ways to care for their patients.

He specifically studies the electrophysiological changes caused by cardiac drugs in heart cell membranes. This basic information is useful for developing more specifically-targeted drugs with fewer side effects.■

Nutrition and Digestion

A healthy digestive system is as essential to survival as a healthy heart and lungs. Though progress in understanding the gastrointestinal system may seem more commonplace and less dramatic than advances in pulmonary and cardiac medicine, it is just as important to improved health care.

The Foundation supports a number of scientists investigating digestion and nutrition. As in other fields, new basic research techniques are leading to a better understanding of the fundamental disease processes.

How do extrinsic and intrinsic nerves control gastrointentinal activity?

Dr. Joe Davison, Heritage Medical Scientist, U of C

The discovery of so-called "brain" neurotransmitters in the gut has opened new avenues of research. Dr. Davison is investigating how substances produced by the digestive system possibly function as neurotransmitters or hormones to regulate gastrointestinal activity. Because this work is so fundamental, it is potentially relevant to many diseases. For example, Dr. Davison collaborates with physicians who specialize in gastrointestinal diseases such as inflammatory bowel disease and colitis.

How is gastrointestinal motor function regulated?

Dr. Brent Scott, Heritage Clinical Investigator, U of C

What mechanisms regulate the internal control of food intake?

Dr. Henry Koopmans, Heritage Medical Scholar, U of C

What factors control the structure and amount of intestinal mucus in diseases such as cystic fibrosis?

Dr. Michèle Mantle, Heritage Medical Scholar, U of C

What is the role of the neurotransmitter GABA in liver disease?

Dr. Gerald Minuk, Heritage Medical Scholar, U of C

How do changes in dietary fat affect cell membranes?

Dr. Tom Clandinin, Heritage Medical Scholar, U of A

PATIENT CARE

How does the metabolism of fatty acids affect various disease states?

Dr. Howard Parsons, Heritage Medical Scholar, U of C

Dr. Parsons is a pediatrician who specializes in nutritional and metabolic disorders. As well as caring for children at the Alberta Children's Hospital, he provides counselling for patients and their physicians throughout Southern Alberta.

Dr. Parsons' research includes three areas: energy expenditure in trauma patients, the metabolism of essential fatty acids in cystic fibrosis patients and others, and the effect of diet lipids on certain cell membrane proteins.■

Using the Body's Natural Defences

The most effective defence against disease is our own immune system. Daily we are exposed to viruses, bacteria, carcinogens, and an assortment of physical stresses. Yet most of us remain generally healthy because our immune system is wonderously designed to battle these disease agents.

Medical researchers are making significant advances in understanding our complex immune system. As they unravel precisely how the various immune cells fight disease in the healthy body, they are developing new therapeutic approaches to illnesses such as diabetes and cancer. The potential for immune therapies grows as researchers discover how to counteract various deficiencies and find new ways to enhance the natural immune system.

Dr. Doug Green

How do cytotoxic T cells kill?

Dr. Chris Bleackley, Heritage Medical Scholar, U of A

If scientists can understand exactly how a cytotoxic cell kills its target, they might be able to enhance the process. Dr. Bleackley has discovered an important new clue. He has identified and cloned two genes that are expressed only in T cells activated by other cells in the immune system to kill tumor cells. These genes encode proteins that are apparently involved the instant a killer cell makes contact with the target tumor cell it will destroy.

How do T cells regulate the immune system?

Dr. Douglas Green, Heritage Medical Scholar, U of A

Dr. Green is investigating how some T cells suppress or turn off immune responses and how other cells then turn off or "contrasuppress" the activity of suppressor cells. Recent animal studies indicate contrasuppressive activity is involved in response to tumors.

How do mast cells function?

Dr. Dean Befus, Heritage Medical Scholar, U of C.

Dr. Befus is investigating the heterogeneity of mast cells, those cells which produce histamine and appear to be involved in inflammatory responses. His work could lead to improved drugs for allergies and more knowledge of other diseases such as inflammatory bowel disease.

What is the role of plasminogen activators?

Dr. David Hart, Heritage Medical Scholar, U of C.

Dr. Hart is investigating the role of proteins called plasminogen activators which are produced by certain cells in the immune system. These proteins have been associated with inflammatory diseases such as arthritis.

How do Peyer's patches function?

Dr. John Reynolds, Heritage Medical Scholar, U of C

Dr. Reynolds is examining how a group of cells in the intestine called Peyer's patches initiate immune responses to antigens.

PATIENT CARE

How are immune responses regulated in some diseases?

Dr. David Matheson, Heritage Medical Scholar, U of C

While most of us have an immune system well-equipped to fight off disease daily, an unfortunate group are immune deficient. For them, a common cold or casual cut can be debilitating or even fatal. Immune deficient children are particularly vulnerable.

In Calgary these children are often referred to the care of Dr. David Matheson, Director of the Immunology Clinic at the Alberta Children's Hospital. In the lab, Dr. Matheson uses patient samples initially required for diagnostic tests to investigate some of the causes of immune deficiency. He examines how drugs affect natural killer cell activity. He has discovered some drugs given chronically for various conditions such as hemophilia or breast cancer, may reduce killer cell activity while other drugs may enhance it. ■

Diagnostic Frontiers

Disease is like any other enemy. Before you can fight it you have to see it, locate it, and call it by name. Ancient physicians settled for calling illness "heart trouble", "nerve trouble", "breathing trouble," or "soul trouble". Frequently, healers were not called upon until the disease had ravaged the body. Eventually physicians developed thick books of highly-categorized diseases with long Latin names. Now treatment often begins when symptoms first surface, before the disease gets a strong hold.

Armed with the new tools of molecular biology, researchers are learning to see the enemy when it first appears—sometimes before symptoms surface at all. Sophisticated imaging and biochemistry techniques detect internal body changes that signal trouble. The electrophysiological testing for cardiac disease discussed earlier in this report is one dramatic example. Imaging technology to detect cancer is another.

How can monoclonal antibodies detect cancer?

Dr. Grant MacLean, Heritage Clinical Investigator, U of A

Dr. MacLean is investigating the use of monoclonal antibodies (MAbs) to detect and monitor various cancers including small cell lung cancer, squamous cell carcinoma, and breast cancer. Because cancerous cells produce antigens differing from those of healthy cells, MAbs (which seek out a specific antigen) can be radioactively labelled and used in imaging cancer. MAbs may also prove useful as carriers that can target a drug straight to the malignant cells so that MAb and drug form a "magic bullet".

How can osteoporosis be detected earlier?

Dr. Thomas Hangartner, Heritage Medical Scholar, U of A

One in every four women over sixty-five will suffer from a bone-weakening condition called osteoporosis. It can lead to fractured limbs and hips and in extreme cases, dowager's hump. The disease builds gradually, often with no external symptoms for many years. Dr. Hangartner has developed a modified CT scanner which accurately detects osteoporosis in the early stages and very quickly shows the results of therapy.

How can chlamydia be diagnosed more efficiently?

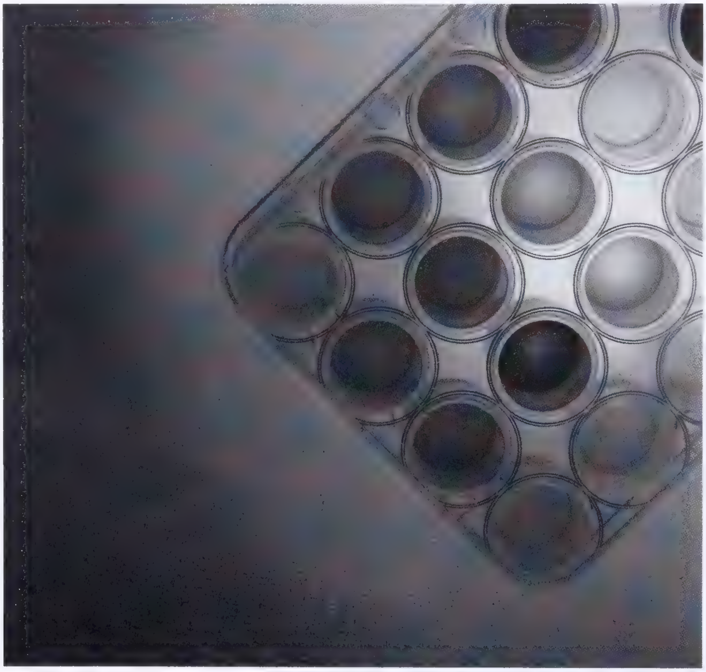
Dr. Wanda Wenman, Heritage Medical Scholar, U of A

Chlamydia, the most common venereal disease, frequently goes unnoticed, with serious consequences. If a woman bears a child while infected, the newborn may have pneumonia or an eye infection. Though there are tests for the disease, they are expensive and not always available in smaller centres. Dr. Wenman is investigating the pathogenesis of chlamydia to develop more effective tests and to identify proteins which might be used for vaccines.

How can lupus, the great impostor, be unmasked?

Dr. Marvin Fritzler, Heritage Medical Scholar, U of C

Physicians call devastating lupus "The Great Imposter" because it so often mimics other diseases and can go undiagnosed for years. Afflicting more than a million North Americans, systemic lupus erythematosus is an autoimmune disease that attacks kidneys, joints, the brain, and sometimes heart and lungs. Dr. Fritzler has pioneered tests to diagnose lupus in the early stages by identifying the presence of autoantibodies in patients. His lab provides diagnostic services for physicians and researchers in Europe, China, Brazil, United States, Canada, and many other countries.



PATIENT CARE

How can NMR image cancer?

Dr. Peter Allen, Heritage Medical Scientist, U of A

Nuclear magnetic resonance (NMR) is a new technique for imaging the body that could revolutionalize cancer diagnosis. Unlike x-rays or CT scans, NMR does not use radiation, but a harmless magnetic field which causes nuclei of various elements in the body to give off electromagnetic signals which can be measured and used to identify whether tissue is healthy or cancerous. NMR visualizes many kinds of tumors more clearly than conventional x-rays or CT scans. Most important, NMR also gives information about the function of the tissues. The latest research indicates it can be used to more accurately assess the spread of cancer and to monitor tumors under treatment.

An international authority on NMR recruited from the University of Nottingham, Dr. Allen heads an NMR research team at the U of A. Three million dollars worth of state-of-the-art NMR equipment is used for animal and clinical studies. Research primarily focuses on cancer patients, but includes studies of stroke patients and children with spina bifida.■

Finding the Culprit

Scientists are discovering that viruses are much more insidious and deadly than ever suspected. They are detecting silent viruses that lurk in the body for years and cause disease long after initial invasion. Some cancers, multiple sclerosis, rheumatoid arthritis, and juvenile onset diabetes have all been recently associated with viruses. The ground-breaking discovery that AIDS is caused by a virus that attacks the immune system has strengthened suspicions and helped make virology one of the most exciting areas in medical research.

For brevity and simplicity in some cases only the general research question is given, with no added description of the investigations.

Do viruses cause neurological diseases like MS?

Dr. Aimo Salmi, Heritage Medical Scientist, U of A

Recruited from The University of Turku, Finland, Dr. Salmi is the acknowledged world authority on the measles virus. In rare cases, childhood measles can leave the child with a persistent viral mutant that some seven to ten years later causes a fatal disease called subacute sclerosing panencephalitis. It destroys the brain. Salmi's basic study of how the measles virus is transformed into this deadly virus may be important for understanding a whole range of virally related diseases, particularly another neurological disease, multiple sclerosis. Salmi suspects contact with a virus may compromise the natural immune system of MS patients years before the disease surfaces.

He works with a number of physicians in clinical research and continues to collaborate with Finnish colleagues who are testing the immunosuppressive drug, cyclosporin, for flare-ups of MS.

Why do some host cells support persistent viruses and others do not?

Dr. Robert Anderson, Heritage Medical Scholar, U of C

In the first step of viral invasion, how does the virus become attached to the host cell?

Dr. Patrick Lee, Heritage Medical Scholar, U of C

How can recombinant DNA technology be used to clone neutralized antigens for viral vaccine development?

Dr. Wai-Choi Leung, Heritage Medical Scholar, U of A

What is the incidence and nature of transfusion-acquired cytomegalovirus?

Dr. Jutta Preiksaitis, Heritage Medical Scholar, U of A.

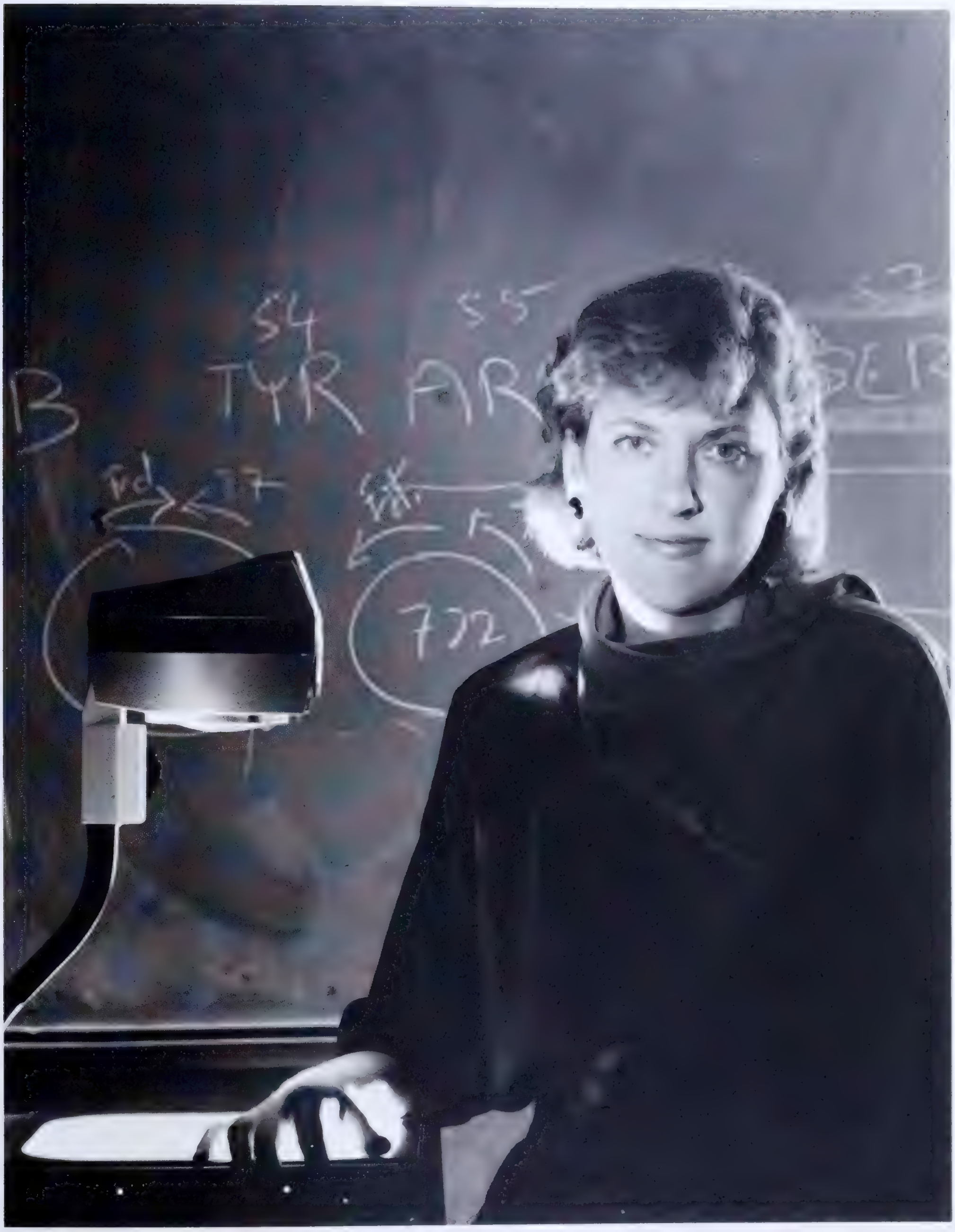
PATIENT CARE

How can viral infections be treated or prevented?

Dr. John Gill, Heritage Clinical Investigator, U of C

Dr. Gill is investigating the treatment and prevention of viral infections. As a physician he has observed a developing resistance to potent new antiviral drugs and is now studying the problem in an animal model of herpes. Building on Dr. Patrick Lee's work, Gill is searching for potential peptide vaccines that use part of the killed virus to stimulate immunity.

Dr. Gill cares for herpes and AIDS patients and serves as a resource virologist at The Foothills Hospital. He also spends considerable time educating the public about these sexually transmitted infections.■



Dr. Jutta
Preiksaitis

Unravelling Neurological Diseases

Our intricate nervous system is more phenomenal than the most complicated computer ever devised. Without nerve signals to process information and pass messages, the body could do nothing. Small wonder, therefore, that diseases of the nervous system tend to be long term, devastating for the patient, burdensome for the patient's family, and very costly to the public health care system. Because the nervous system is so complex we know relatively little about neurological diseases.

Fortunately, scientists have developed new tools that have expanded the possibilities of neurological research and made it a rapidly developing frontier. For example, researchers now have electrophysiological techniques to determine precisely when a nerve cell is fired. Advanced biochemistry techniques are used to identify and follow the action of neurotransmitters, compounds found in the brain and elsewhere which relay messages between nerve cells. As the many names listed on these pages indicate Foundation funding has helped Alberta researchers develop great strength in the neurosciences.

Many basic studies focus on the visual system because more is known about it than any other part of the nervous system.

How does the visual cortex process information?

Dr. Gary Blasdel, Heritage Medical Scholar, U of C

Dr. Blasdel has been internationally acclaimed for his breakthrough in mapping the brain at work. He has devised a way to use voltage sensitive dyes to track activity patterns of neurons in the primary visual cortex. Using the new technique, he has discovered a unit of cortical organization that may partly explain how our brains process visual information.

Is the auditory system plastic?

Dr. Jos Eggermont, Heritage Medical Scholar, U of C

Why do neurons fire all at once in an epileptic seizure?

Dr. Brian MacVicar, Heritage Medical Scholar, U of C

What causes brain damage in ischemia, hypoglycemia and epilepsy?

Dr. Roland Auer, Heritage Medical Scholar, U of C

How do spinal cord neurons control movement?

Dr. Andy Hoffer, Heritage Medical Scholar, U of C

Do certain peptides act as neurotransmitters in the brain and influence blood pressure and other factors?

Dr. Quentin Pittman, Heritage Medical Scholar, U of C

How are signals relayed from the eye to the brain?

Dr. Douglas Bowling, Heritage Medical Scholar, U of C

What are the electrical properties of retinal neurons?

Dr. Fred Quandt, Heritage Medical Scholar, U of C

What factors control the regeneration of the optic nerve in amphibians?

Dr. Thomas Reh, Heritage Medical Scholar, U of C

Dr. Irma
Parhad

What is the functional architecture of the vertebrate retina?

Dr. Edward Famiglietti, Heritage Medical Scholar, U of C

What is the role of synaptic transmitters in the visual and somatosensory regions of the brain?

Dr. Philip Hicks, Heritage Medical Scholar, U of C

How does calcium regulate neurotransmitters ?

Dr. Norman Stockbridge, Heritage Medical Scholar, U of A

What is the role of a neurotransmitter called GABA in liver disease?

Dr. Gerald Minuk, Heritage Medical Scholar, U of C

How do nerves signal muscles to contract?

Dr. Michael Delay, Heritage Medical Scholar, U of C

How do neuromuscular junctions develop?

Dr. M. John Anderson, Heritage Medical Scholar, U of C

Is the adult nervous system capable of regeneration?

Dr. Andy Bulloch, Heritage Medical Scholar U of C

PATIENT CARE

What are the mechanisms in the pathology of Alzheimer's disease?

Dr. Irma Parhad, Heritage Medical Scholar, U of C

One of the most devastating neurological diseases is Alzheimer's disease, the dementia that affects an estimated 100,000 to 300,000 Canadians. Though the disease is common, nobody knows what causes it, how to accurately diagnose it, or how to treat it. Presently, the only conclusive evidence is a brain biopsy.

Diagnosis is particularly crucial because dementia can be caused by a number of other conditions that may be treated successfully including infections, tumors, alcoholism and psychiatric disorders. Dr. Irma Parhad has established the U of C Dementia Clinic where patients are referred for diagnosis of Alzheimer's and other dementias. The response has been so great, the clinic has a long waiting list. Patients and physicians are also guided in the limited choice of therapies presently available. The clinic is jointly funded by The Foothills Hospital and The Alzheimer's Society of Calgary.

Back in the lab Dr. Parhad seeks answers to basic questions about Alzheimer's disease. She uses animal models to investigate the cellular events that cause accumulation of the neurofibrillary tangles found in the brain of Alzheimer's patients.

She also spends considerable time educating the medical community and the public about Alzheimer's disease.■

Scientists of the Future

Scientists have a saying: If you have a difficult, complex problem, the easiest thing to do is give it to a young person who doesn't know it's such a complex problem and he or she will solve it.

The Foundation has given over 2,000 young people research career opportunities. The aspiring neurologist, cardiologist, or biochemist can learn from widely respected scientists in Alberta and gain entry to almost any other lab in North America or beyond. What is not so obvious is the contribution young people make. Bright, enthusiastic students are vital to any scientific community. Without them research activity would decay through attrition and inertia.

After six years some of the scientists-in-training have learned their lessons well and become independent researchers and physicians serving Alberta and the rest of Canada.

Dr. Edwardo Bruera

What is the structure of drug molecules?

Alice Vrielink, Masters Student, U of C

Alice Vrielink was awarded the prestigious Overseas Science Research Scholarship given annually to 10 individuals in the Commonwealth. Working under the supervision of Heritage Medical Scholar Dr. Penelope Codding, Ms. Vrielink used x-ray crystallography to solve the structure of some key drug molecules. This is a step towards developing more effectively targeted drugs.

How are bone marrow cells affected by radiation therapy for cancer?

Joan Allalunis-Turner, PhD Student, U of A

Working with animal models at the Cross Cancer Institute, Joan Allalunis-Turner discovered not all bone marrow cells respond uniformly to radiation therapy and a drug called misonidazole which is used to increase cell sensitivity to radiation. She then moved on to postdoctoral studies at The University of Rochester under a Foundation Fellowship and now has a staff position at the Cross Cancer Institute.

How do bacteria establish themselves in the host to cause infections?

Brett Finlay, PhD Student, U of A

During his graduate studies Brett Finlay produced 11 papers on his bacterial investigations in Dr. William Paranchych's lab. Dr. Finlay's work centered on the role of pili, filament appendages found in certain bacteria. One of North America's leading medical microbiologists, Dr. Stanley Falkow, of Stanford University, subsequently invited Finlay to join him for postgraduate work. Now a PhD graduate, Dr. Finlay has an AHFMR Fellowship to support his studies with Dr. Falkow.

Are commonly used drugs toxic for the elderly?

Dr. John Kennedy, Heritage Fellow, Tufts University, Boston

A psychiatrist from the U of C, Dr. Kennedy is investigating drug-induced illness in the elderly. Very little is known about this recently-identified problem. Many older people chronically take multiple medications and the resulting toxicity can cause complications ranging from the inconvenient to the fatal. Even self-administered drugs such as aspirin and caffeine may be toxic in the elderly.

Dr. Kennedy is one of 38 Fellows studying with specialists outside Alberta to gain expertise in new areas of medicine.

Are there drugs that could reduce the severity of burn wounds?

Alan Taniguichi, Summer Student, U of A

Medical student Alan Taniguichi spent a summer working with physicians in the Firefighters Burn Trust Unit Laboratory. He helped develop an animal model of burn injury which was used to test how two known and two unknown drugs affect burn wounds. Each year the Foundation funds about 200 summer students in almost every area of medical research. A number of students have been funded for two or three consecutive summers.

How are T-lymphocytes regulated?

Dr. John Elliott, Heritage Fellow, U of A

After earning his medical degree, Dr. Elliott wished to pursue his interest in medical research.The Foundation awarded him a Fellowship to support his PhD studies on cancer immunotherapy in Dr. Verner Paetkau's lab. Dr. Elliott's research has since earned him a Centennial Fellowship from the Medical Research Council to pursue further studies in the United States.

PATIENT CARE

How can pain be more effectively controlled?

Dr. Eduardo Bruera, Heritage Clinical Fellow, U of A

Dr. Bruera has adapted an intravenous pump for narcotic administration so that outpatients at the Cross Cancer Institute can administer their own pain killers. The device means patients who previously would have to be hospitalized for pain control can live at home. He is investigating other aspects of pain and nausea in cancer patients. One study explores the use of a new drug to counteract the sleepiness produced by narcotics.■

FROM FELLOW TO SCHOLAR

Fellowships are given to highly qualified doctoral graduates of medical, dental, or basic science programs who need more research experience or specialized research experience in a specific area. A number of Alberta scientists who have been given Fellowships to gain expertise outside the province have returned as Heritage Medical Scholars and now give Albertans specialized care.

Calgary orthopedic surgeon, Dr. Cy Frank studied in Dr. Wayne Akeson's lab at The University of California for three years and is now a Heritage Medical Scholar heading a new connective tissue laboratory at the U of C. Virologist, Dr. John Gill had an AHFMR Fellowship to study with Dr. Lorne Tyrrell at the U of A before becoming a Clinical Investigator at the U of C. Dr. Garth Warnock had a Clinical Fellowship to study islet cell transplantation for diabetes at Oxford University in the U.K. This gave him the necessary expertise to pursue independent studies as a Heritage Medical Scholar at the U of A.

> *"The subsequent record of those who have completed full-time Studentships and Fellowships can be considered as more than satisfactory. Of the 172 Students who have completed their programs (113 Ph.D., 59 M.Sc.), 110 have pursued postdoctoral training, 16 have entered an M.D. program and 16 a Ph.D. program. Of the 250 Fellows who have completed their postdoctoral training as Heritage Fellows, 71 are in academic research positions, 92 are employed in a professional/technical capacity, and 51 are taking additional postdoctoral research or clinical fellowship training — a total of 214."*
>
> IBR REPORT

> *"All of those in the two Faculties of Medicine whom we interviewed — from students to deans — attested to the remarkable milieu for medical research and research training which had developed as a result of the recruitment of an unusual mix of talented investigators and students and the support of research through Establishment Grants and Grants for Faculty Travel, Visiting Professors and Scientists, Conferences and Workshops."*
>
> IBR REPORT

SCIENCE FAIR SUPPORT

Every year hundreds of enthusiastic Canadian teenagers develop research projects ranging from the effects of smoking to applied robotics. The projects are part of the School Science Fair program sponsored by the Youth Science Foundation in Ottawa.

The program has long been recognized as a valuable training ground for young scientists and the Foundation is pleased to support the seven regional science fairs in Alberta. The Foundation gives each science fair an operating grant and a special AHFMR Award of Excellence for the best project in the life sciences category. Winners of these awards are given travel expenses to the national fair and an expense-paid visit to a researcher's lab at the U of A or the U of C.

The Foundation also supported Canadian astronaut Dr. Ken Money as a keynote speaker at the 1985 National Science Fair hosted by Calgary. ■

The Third Epoch

The 1986 Nobel Prize for Medicine was given to Drs. Rita Levi-Montalcini and Stanley Cohen some 30 years after they discovered nerve growth factor and epidermal growth factor. The Nobel Committee explained that the researchers were honoured so long after their discoveries because only in the last ten years has their tremendous significance been recognized. (As often happens, Dr. Levi-Montalcini said she was lucky because she was actually looking for something else.) Canadian Dr. John Polanyi was given the 1986 Nobel Prize for Chemistry for his investigations of how molecules interact in a reaction. Some of his early studies laid the groundwork for the later development of the laser, so important in industry and medicine.

Such is the nature and promise of basic research. While many Foundation scientists conduct clinical research as well, the majority conduct basic research. In doing so, they are part of the third epoch in the history of medical knowledge.

In the beginning, medical research and practise was concerned with the appearance of disease and treatment, whether or not causes were understood. In the second epoch, with more advanced knowledge of body processes, research was geared toward understanding causes and treatment. The third and present epoch brings medical researchers to a new frontier, the amazing universe of the single cell. Basic molecular research is leading to new understanding of the human body and new hope for prevention of disease. Scientists have new tools to probe the workings of a neuron, a protein, an enzyme, or a gene and the results could be relevant to almost any disease state. Basic research is exciting because a valuable finding may come at any time. It may be something unexpected by the researcher and its relevance may not be recognized for years.

Because much basic research is difficult to explain briefly, many studies supported by the Foundation have not been outlined in this report. The following sample illustrates the breadth and value of molecular biological research. Any of these studies could open new paths to improved cancer therapy.

Is there a genetic predisposition towards cancer?

Dr. Malcolm Paterson, Heritage Medical Scientist, U of A

Dr. Paterson is investigating the molecular mechanisms underlying the interaction between environmental factors and hereditary factors that cause cancer. Normally when we are exposed to carcinogens such as sunlight, there is a natural DNA repair process. Dr. Paterson has found this to be faulty in people who have rare hereditary familial diseases that predispose them to cancer.

While such information could prove useful for developing screening tests, Dr. Paterson's main goal is understanding the fundamental cancer process. What is the role of oncogenes in uncontrolled cell growth? Understanding this, he says, is our best hope for prevention.

Is the monoclonal antibody HNK-1 linked with childhood cancer?

Dr. Ronald McGarry, Heritage Medical Scholar, U of C

Dr. McGarry's immunological studies focus on a protein associated with myelination which could be key in the demyelinating disease, multiple sclerosis. However, he has found that the antibody he studies, HNK-1, also reacts with neuroblastoma cells, a major childhood cancer. This creates a new lead that might link cancer and multiple sclerosis as two diverse diseases associated with viruses.

Dr. Malcolm
Paterson

How do protein receptors recognize carbohydrates?

Dr. Ole Hindsgaul, Heritage Medical Scholar, U of A

Protein receptor recognition of complex carbohydrates is important in many body functions such as regulation of hormones and the immune system. As part of his work, Dr. Hindsgaul has identified the molecular structure of an antigen in a human melanoma cell line. This might explain how cell surface carbohydrates affect tumor development.

How do normal and leukemic blood cells differ in structure and development?

Dr. Patrice Mannoni, Heritage Medical Scholar, U of A

Dr. Mannoni is analyzing the humoral and cellular regulatory mechanisms of normal and leukemia hemopoiesis, the process whereby cells differentiate and proliferate from stem cells.

How does the rabbit poxvirus promote tumors?

Dr. Grant McFadden, Heritage Medical Scholar, U of A

There is considerable evidence that viruses are a factor in malignant cell transformation and Dr. McFadden's study of the tumorogenic rabbit fibroma virus may elucidate a viral connection.

How are genes expressed in the transcription of DNA and RNA?

Dr. David Bazett-Jones, Heritage Medical Scholar, U of C

If Dr. Bazett-Jones can discover how the transcription machinery of cells knows how to start reading a particular gene rather than reading the whole library, it would help clarify why genes are deregulated in cancer and other diseases.

What is the biochemical basis of mutation?

Dr. Linda Reha-Krantz, Heritage Medical Scholar, U of A

Dr. Reha-Krantz is examining key enzymes that control DNA replication to determine why inaccurate replication occurs. Carcinogenesis may involve inaccurate DNA replication.

What is the signal system of cells?

Dr. Jerry Wang, Heritage Medical Scientist, U of C

Dr. Jerry Wang heads the six-member cell regulation group investigating molecules called second messengers that make up a complex cellular communication system. Because these second messengers are involved in every major body process, the studies could eventually be relevant to many diseases. Most of Dr. Wang's research focuses on a calcium-binding protein called calmodulin. One of his many studies examines how calmodulin may help regulate cell transformation.

Two Heritage Medical Scholars in the cell regulation group are conducting basic studies that relate to many diseases. Dr. Michael Walsh is investigating the signal mechanisms involved in smooth muscle contraction. Because the esophagus, intestine, stomach, and vascular system contain smooth muscles, his work could advance knowledge about hypertension, muscular dystrophy, gastrointestinal, respiratory and cardiac disease. Dr. David Waisman has characterized three calcium-binding proteins that could be important in multiple sclerosis and heart disease where calcium concentration is abnormal.

The productivity and reputation of the cell regulation group is evident in its publication record — over 35 papers — and in the $700,000 of operating funds they have acquired from other funding agencies.■

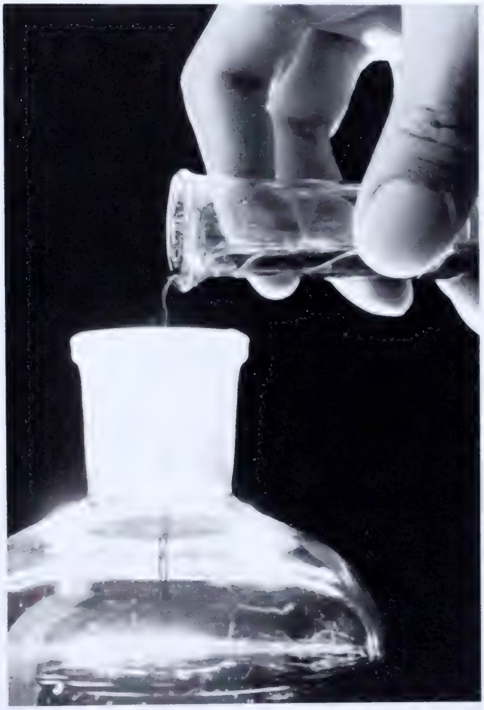
Technology Transfer

The first step towards improved health care is gathering new knowledge about the human body and the second step is applying that knowledge to patient care. The time lapse between the two steps is often 10 to 20 years. The Foundation has developed a new Technology Transfer Program to shorten that time gap. Technology Transfer Grants bring together scientists and business people by supporting the research and development of a promising scientific idea until it can attract investment capital.

There are two levels of grants to take discovery from the laboratory to the marketplace. Phase I Grants ($25,000) allow a scientist to establish the feasibility of a promising idea. Phase II Grants ($75,000) apply when a product or technique has been laboratory tested but requires further refinement to attract investment. Any scientist or engineer in an Alberta university or an Alberta-based business is eligible to apply. Development of the following innovations are supported by AHFMR Technology Transfer Grants.

New Antiviral Drugs

Viruses range from the inconvenient to the fatal and attack all of us sooner or later. Though there are a number of antiviral drugs on the market they tend to be very specific and ineffective for long periods of time because the viruses become resistant to them. U of A pharmacologist Dr. Ronald Micetich has discovered a series of compounds that may eliminate both problems. Arilidone-derived antiviral compounds exhibit broad spectrum activity against many viruses including herpes, picornavirus, and the rhinovirus which causes the common cold. His initial tests are promising and he is collaborating with Japanese investigators on clinical testing. He hopes Japanese businessmen and scientists will become partners in a joint-venture company based in Alberta to further test and eventually manufacture the compounds for the marketplace.



Light Fantastic: Medical Lasers

Medical lasers can cut through tissue without causing bleeding, destroy a tumor, repair delicate blood vessels in the retina, seal hemorrhaging tissue, and drill a tooth in milliseconds. Laser surgery lessens pain and scarring. Despite their potential, the utility of lasers is limited by their size, cost, and lack of suitable devices for delivering the laser beam to the desired site on the body.

U of A engineer Dr. John Tulip has developed several innovative lasers which promise to solve these problems. He has devised a delivery arm that is smaller and lighter than the conventional CO_2 laser delivery system. He has also designed a portable miniature CO_2 laser that would dramatically reduce the size and cost of surgical lasers. He has used the same engineering techniques to create a small, portable laser that could replace the dentist's drill.

While the CO_2 laser is used for cutting, another type of laser called the YAG laser is used to shrink blood vessels and cauterize. Dr. Tulip has engineered a YAG laser that has the capacity to cut as well as cauterize. He has proven the laser works experimentally and is constructing a prototype hospital system to be tested at The University of Alberta Hospitals. The innovative YAG laser would make endoscopic surgery possible and would give physicians a tool for unclogging sclerotic arteries. Dr. Tulip received $150,000 in Technology Transfer Grants to refine the new lasers and establish their marketability.

Mask for "Snoring" Disease

Heritage Medical Scientist Dr. John Remmers has developed an improved therapeutic mask for managing a common breathing disorder called sleep apnea. Apnea causes many serious problems including high blood pressure, depression, impotence, and mental deterioration. Excessive snoring is one symptom. Dr. Remmers had developed a nasal airway positive pressure system (NAPP) which effectively treats patients, but the sleeping mask is awkward, noisy, and uncomfortable. A Phase I Technology Transfer Grant funds development of an improved mask which will be superior to the only other NAPP system available in North America.

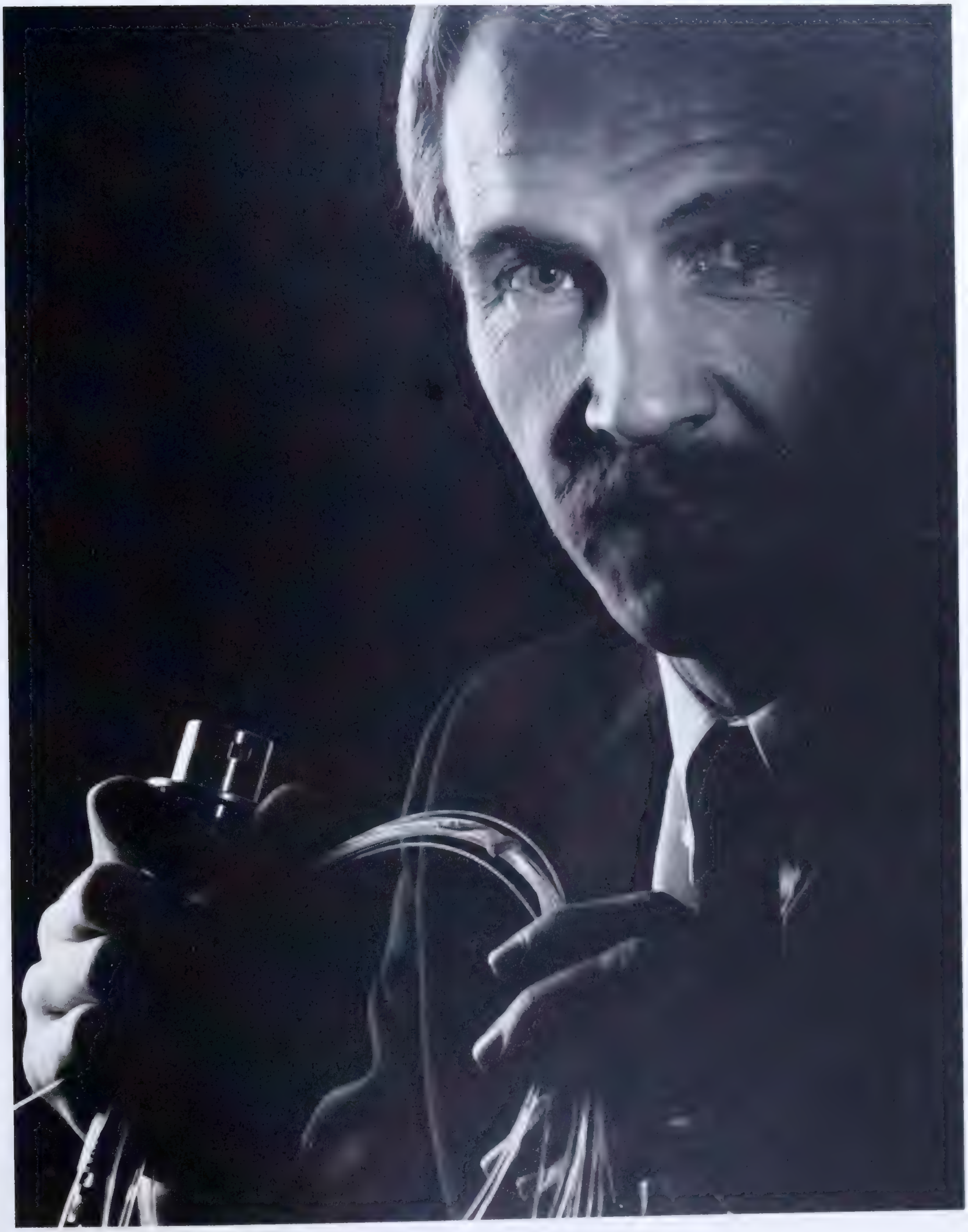
Artificial Pancreas and Kidney

Heritage Medical Scholar Dr. Henry Koopmans at the U of C has designed an artificial pancreas and kidney using a new principle which will remain confidential for patent purposes. His Phase I grant will be used to produce a workable prototype out of biocompatible plastic and test it on animals for tissue and blood compatibility.

Peptide Manufacturing

By the year 2000 there will be a $9 billion international market for biotechnology products in the areas of hormones, blood products, and other related peptide products. Peptides are naturally-occuring substances that regulate many basic body processes including reproduction, pain, sleep, and response to stress or infection.

Drs. Robert Hodges and Robert Parker have pioneered work in synthesizing peptides and vaccines at the U of A. Funded by a Technology Transfer Grant they have formed a partnership with businessman Jerome McElroy to market a process for synthesizing peptides. Their proposed company, Synthetic Peptide Inc. will be the first Canadian-owned and controlled pharmaceutical company in the peptide field.■



Dr. John
Tulip

Meeting of Minds

A dynamic medical research community depends upon a constant interchange of ideas among scientists at the national and international level. Any researcher who does not keep abreast of rapid advances will be quickly left behind.

AHFMR conference grants, visiting professorships and lecturer grants facilitate this vital interchange.

Conferences Cover Broad Range of Topics

Dubbed "The Silent Killer", high blood pressure affects at least 10 percent of us, but because there are no outward symptoms we often don't know we have it. Usually it is the family physician who identifies the condition. However, physicians don't agree upon what constitutes an abnormally high level of blood pressure nor do they agree when or how hypertension should be treated.

In 1984 leading hypertension researchers met at the U of C in a symposium sponsored by the university, The College of Family Physicians of Canada, and the Foundation. After much lively debate, they compiled definitions of hypertension and concrete recommendations for monitoring and treatment. These were published in *The Canadian Family Physician* along with a pull-out chart for ready reference in the doctor's office.

The hypertension symposium was one of 60 conferences sponsored in whole or in part by the Foundation. International conferences such as diabetes conferences held at the U of A and the U of C bring together world leaders. At the same time they focus attention on advances being made by Alberta scientists. For example, after the first infectious diseases conference, several American researchers said they had been unaware of the amount of quality research in Alberta. Other events such as a dental research symposium help Alberta investigators identify new directions in research.

Some conferences focus on technical issues such as the development of radioprotectors and radiosensitizers in cancer therapy. Others focus on health problems in a broader context. For example, speakers at the International Symposium on Organ Transplantation examined moral, ethical, legal, and medical issues.

Each year the Foundation sponsors Heritage Days which bring together scientists at the U of A and U of C to share information. Unlike most scientific forums, the event gives students an opportunity to present their work. Heritage Days also hosts guest speakers. These have included Dr. Norman Shumway, cardiac transplantation specialist from Stanford; Dr. Lawrence Drew, AIDS researcher from The University of California School of Medicine in San Francisco; and biochemist Dr. Edwin Krebs from The University of Washington in Seattle.

Visiting Professors

Nobel Laureate Dr. David Hubel shares his research on how the visual cortex processes information.

Linda Panepinto from Colorado State University introduces Alberta researchers to the many advantages of Yucatan pigs as a research animal.

Dr. John Denmark, British psychiatrist and pioneer in treating the deaf, consults with educators and physicians in Alberta.

University of Toronto Law Professor, Bernard Dickens helps the legal and medical communities sort out ethical dilemmas.

Dr. Balfour Mount, McGill surgeon and palliative care pioneer, reviews the advances and issues in palliative care.

These are five of the 24 AHFMR Visiting Professors who shared their expertise with Alberta researchers from 1983-1986. In addition to consulting with scientists, many of the visitors gave public lectures to inform the general community about scientific advances and to discuss controversial health care issues.■

Equipment Grants

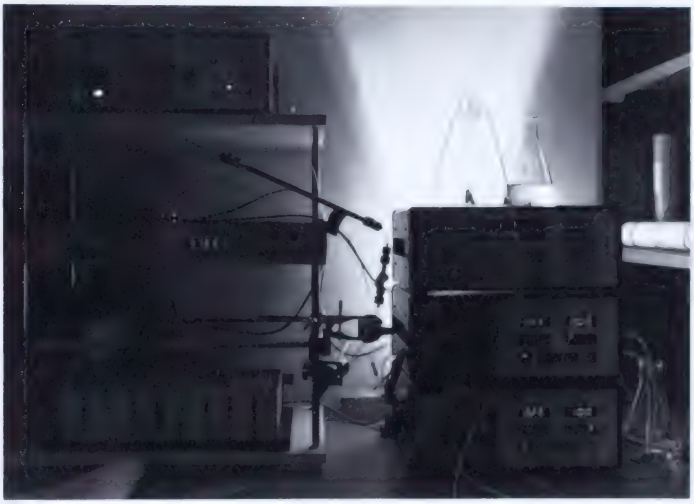
The Foundation is committed to providing researchers with the state-of-the-art technology they require to compete on the frontiers of medical research. Major equipment grants are given not only to Heritage-funded scientists but to many other researchers in Alberta. Since its inception the Foundation has funded equipment in over 250 laboratories. Priority is given to applications for equipment that will be used by many investigators or by a single investigator who will supply information or material to many colleagues.

Three million dollars in funding has provided Dr. Peter Allen's U of A lab with the most advanced nuclear magnetic resonance equipment available for diagnostic imaging in research and patient care. (see page 30) This is one of a handful of such facilities in the world. The Foundation has also funded North America's first commercially-produced electron imaging spectrometer added to a conventional transmission electron microscope for Heritage Medical Scholar Dr. David Bazett-Jones. This equipment magnifies biological particles hundreds of thousands of times and is revolutionary because it pictures both their structures and chemical make-up.

Another major equipment grant given to Drs. Wayne Anderson and Mike James at the U of A has provided a highly specialized piece of equipment that measures x-ray diffractions in a process used to determine the structure of molecules. One of a few in Canada, this equipment serves the two scientists and their many collaborators in a variety of investigations such as the nature of autoimmune antibodies in lupus and work on the mechanisms of high blood pressure drugs.

Sometimes unique research requires customized equipment. For example Dr. Benno Nigg's studies of biomechanics at the U of C are aided by a Foundation-funded computer system which allows him to measure minute body movements. This information is applied to health studies ranging from research on how certain running shoes might prevent sports injury to analyses of movement in children with muscular dystrophy.

In another example, Dr. Larry Wang and his colleagues at the U of A were able to pursue their hypothermia research and other environmental studies with a Foundation major equipment grant that supplied a cold room. Heritage Medical Scholar Dr. Gary Blasdel has extensive grants for highly technical, customized facilities used to map the brain of primates by a process he has pioneered. This process has already yielded totally new information about cortical function.



PATIENT CARE

While some of the major equipment funded is used primarily to advance basic studies, a portion is important for both research and patient care. For example, Dr. Dante Manyari received over $300,000 for a mobile gamma camera, computer, and emergency arrhythmia therapy equipment to use in his clinical studies at the Foothills Hospital. This is only one of several major equipment grants awarded to cardiac researchers.■

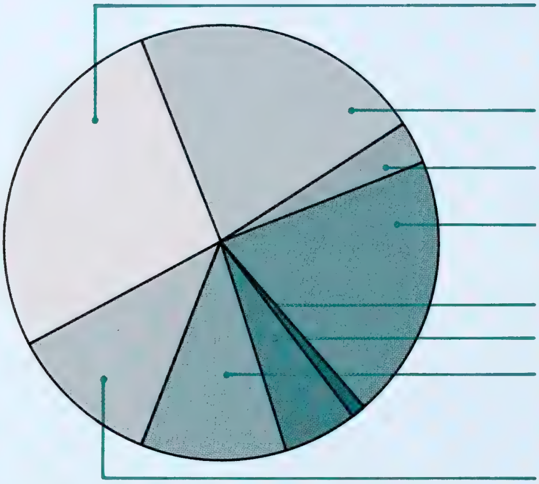
New Heritage Medical Research Buildings

In 1984 the Foundation concluded that new multidisciplinary research groups could not be established without new laboratory space at the U of A and the U of C. Because neither university was able to generate funds to construct new space and because the Foundation would have to pay substantial rent for commercial space, the Trustees agreed to provide funds for 5,000 net square metres of laboratory space at both universities. The facilities now under construction are connected to the respective principal teaching hospitals and the spaces are designed to promote maximum interdisciplinary collaboration.

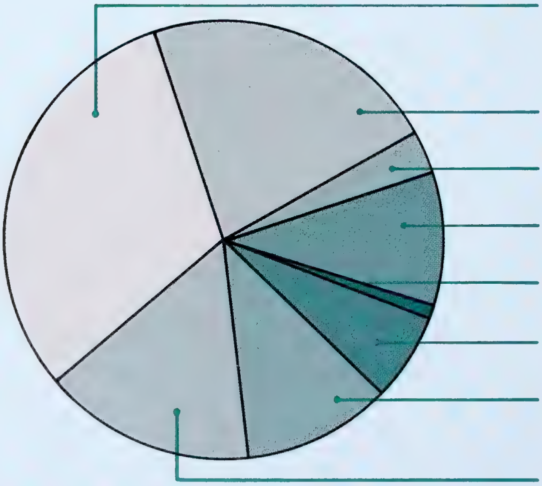
Proposals for research groups must indicate a major scientific focus with "bench to bedside" objectives. The Foundation's Scientific Advisory Council approves proposals and the Foundation retains the right to approve space allocation and use for ten years.■

Statistics

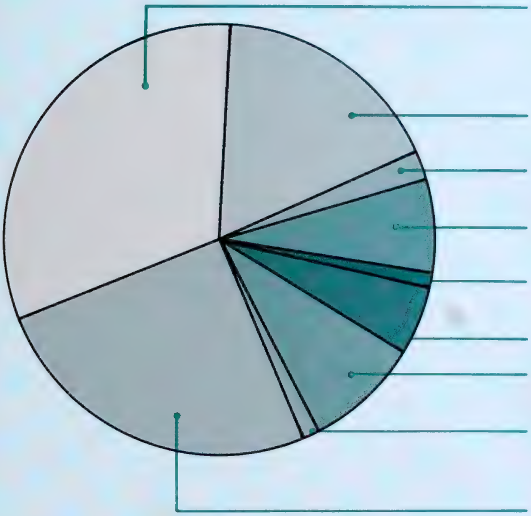
Expenditures



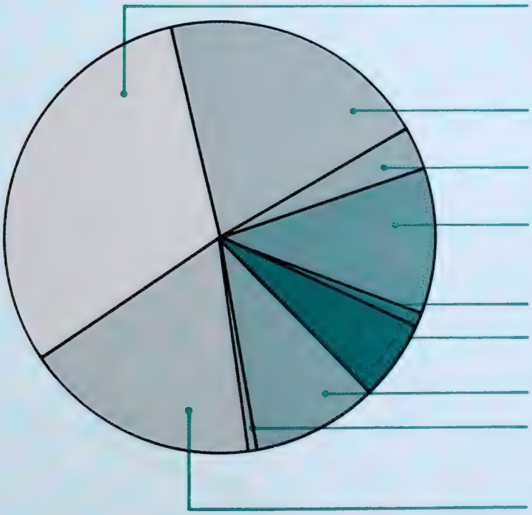
AHFMR Expenditures 1983-84	Total $28.80 M
Scholarship/Heritage Medical Scientist Awards, Clinical Investigators, Establishment Grants	$7.70 M
Fellowship Awards and Research Allowances	$6.10 M
Administrative Costs	$1.10 M
Major Equipment Grants and Maintenance (excluding Establishment Grants)	$5.70 M
Scientific Policy and Evaluation Costs	$0.20 M
General Research Grants*	$1.80 M
Studentship Awards and Research Allowances	$3.10 M
Research Support Costs and Institutional Grants to Universities**	$3.10 M



AHFMR Expenditures 1984-85	Total $34.03 M
Scholarship/Heritage Medical Scientist Awards, Clinical Investigators, Establishment Grants	$10.63 M
Fellowship Awards and Research Allowances	$7.37 M
Administrative Costs	$1.08 M
Major Equipment Grants and Maintenance (excluding Establishment Grants)	$3.42 M
Scientific Policy and Evaluation Costs	$0.21 M
General Research Grants*	$2.42 M
Studentship Awards and Research Allowances	$3.67 M
Research Support Costs and Institutional Grants to Universities**	$5.23 M



AHFMR Expenditures 1985/86	Total $45.34 M
Scholarship/Heritage Medical Scientist Awards, Clinical Investigators, Establishment Grants	$14.29 M
Fellowship Awards and Research Allowances	$8.01 M
Administrative Costs	$1.06 M
Major Equipment Grants and Maintenance (excluding Establishment Grants)	$3.46 M
Scientific Policy and Evaluation Costs	$0.40 M
General Research Grants*	$2.52 M
Studentship Awards and Research Allowances	$4.06 M
Technology Transfer Grants	$0.05 M
Research Support Costs and Institutional Grants to Universities**	$11.49 M



AHFMR Expenditures 1983-86	Total $108.17 M
Scholarship/Heritage Medical Scientist Awards, Clinical Investigators, Establishment Grants	$32.62 M
Fellowship Awards and Research Allowances	$21.48 M
Administrative Costs	$3.24 M
Major Equipment Grants and Maintenance (excluding Establishment Grants)	$12.58 M
Scientific Policy and Evaluation Costs	$0.81 M
General Research Grants*	$6.74 M
Studentship Awards and Research Allowances	$10.83 M
Technology Transfer Grants	$0.05 M
Research Support Costs and Institutional Grants to Universities**	$19.82 M

* Conference Grants, Visiting Scientists, Visiting Lecturers and Faculty Travel, Independent Establishment Grants, Independent Research Allowances, Special Initiative Funding, Visiting Professorships and Clinical Traineeships

** Includes Institutional Grants for planning and construction of new research buildings.

Summary of the Financial Statements for the 3 Years Ending March 31

	1986	1985	1984
REVENUE			
Transfers from the Alberta Heritage Foundation for Medical Research Endowment Fund	$45,000,000	$32,000,000	$31,000,000
Interest	580,725	640,534	630,060
	45,580,725	**32,640,534**	**31,630,060**
EXPENDITURE			
Scientific affairs:			
Scholarship and establishment grants	9,873,094	6,950,395	6,416,400
Fellowship grants and research allowances	6,781,100	6,660,212	6,143,662
Building program grants	5,496,000	750,000	300,000
Studentship grants and research allowances	4,056,986	3,670,918	3,083,212
Heritage medical scientist grants	3,735,616	3,184,706	1,312,457
Major equipment and maintenance grants	3,462,611	3,419,863	5,702,701
Institutional grants	3,394,433	2,176,863	1,070,077
Research support costs	2,572,272	2,252,069	1,734,717
Clinical fellowship grants	1,231,857	713,911	—
Independent establishment grants	1,147,464	1,282,044	448,872
Clinical investigatorship grants	677,360	490,756	—
Visiting lecturer grants to universities	368,883	340,375	336,475
Conference support grants	248,121	300,545	314,254
Travel grants to universities	198,752	205,953	254,916
Special initiative funding	186,071	25,358	—
Visiting scientist grants	183,748	146,802	271,577
Independent research allowances	111,876	105,973	108,567
Technology transfer grants	55,000	—	—
Clinical trainee grants	40,957	—	—
Recruitment and planning grants to universities	25,888	28,735	30,052
Visiting professor honoraria and travel grants	23,170	16,463	26,663
Research professor-in-residence	7,444	26,056	8,000
	43,878,703	**32,747,997**	**27,562,602**
Administration expenses	1,023,578	963,279	941,373
Scientific Advisory Council expenses	156,674	138,858	143,568
Trustee expenses	142,947	112,609	113,437
Other committee expenses	106,526	71,325	75,568
	45,308,428	**34,034,068**	**28,836,548**
Operating surplus (deficit) for the year	**$ 272,297**	**$(1,393,534)**	**$ 2,793,512**

Balance Sheets as at March 31

	1986	1985	1984
ASSETS			
Cash	$5,511,095	$5,084,677	$6,027,558
Accounts receivable	153,138	113,089	71,102
Accrued interest receivable	3,446	4,950	4,058
Prepaid expenses	20,858	8,981	2,794
Mortgages receivable from research scientists	670,653	588,396	567,288
Fixed assets	271,757	350,153	209,224
	$6,630,947	**$6,150,246**	**$6,882,024**
LIABILITIES AND SURPLUS			
Accounts payable	$1,707,742	$1,499,338	$ 837,582
Revenue surplus	4,923,205	4,650,908	6,044,442
	$6,630,947	**$6,150,246**	**$6,882,024**

Awards Implemented During the Year Ending March 31
(Includes Both New and Continuing Awards)

	1984	1985	1986
Heritage Scholarship			
U of A	22	27	34
U of C	35	46	59
Total	**57**	**73**	**93**
Heritage Scientist			
U of A	1	2	2
U of C	4	8	8
Others	—	—	1
Total	**5**	**10**	**11**
Full-Time Fellowship			
U of A	97	119	111
U of C	74	83	83
Others	41	36	33
Total	**212**	**238**	**227**
Part-Time Fellowship			
U of A	1	3	2
U of C	12	8	9
Others	1	1	—
Total	**14**	**12**	**11**
Clinical Fellowships			
U of A	—	2	5
U of C	—	7	9
Others	—	12	15
Total	**—**	**21**	**29**

	1984	1985	1986
Independent Research Allowance (Fellowship)			
U of A	5	1	—
U of C	3	5	6
Others	6	11	8
Total	**14**	**17**	**14**
Independent Research Allowance (Studentship)			
U of A	8	8	11
U of C	7	11	8
Others	3	3	2
Total	**18**	**22**	**21**
Full-Time Studentship			
U of A	102	143	136
U of C	97	93	100
Others	5	5	5
Total	**204**	**241**	**241**
Part-Time Studentship			
U of A	4	2	3
U of C	2	2	2
Total	**6**	**4**	**5**
Summer Studentship (New Awards Only)			
U of A	105	124	89
U of C	59	76	68
Others	2	3	1
Total	**166**	**203**	**158**

Awards Implemented During the Year Ending March 31
(New Awards Only)

	1984	1985	1986
Clinical Investigators			
U of A	—	3	4
U of C	—	1	2
Total	—	**4**	**6**
Clinical Traineeship			
U of C	—	1	—
Independent Establishment Grant			
U of A	1	6	1
U of C	—	4	—
Total	**1**	**10**	**1**
Major Equipment			
U of A	61	29	16
U of C	33	19	9
Others	2	—	—
Total	**96**	**48**	**25**
Conference Grant			
U of A	7	9	4
U of C	10	10	5
Others	1	—	2
Total	**18**	**19**	**11**

	1984	1985	1986
Visiting Professors			
U of A	6	4	6
U of C	4	1	4
Total	10	5	10
Visiting Scientist To			
U of A	4	2	1
U of C	5	3	2
Total	9	5	3
Visiting Scientist From			
U of A	3	2	1
U of C	2	—	1
Total	5	2	2

Applications Processed for the Year Ending March 31

	1984			1985		
	APPLICATIONS RECEIVED	APPLICATIONS APPROVED	PERCENT APPROVED	APPLICATIONS RECEIVED	APPLICATIONS APPROVED	PERCENT APPROVED
FT Studentship	183	101	55	191	100	52
PT Studentship	5	4	67	2	2	100
Summer Studentship	268	173	65	304	217	71
FT Fellowship	197	107	54	205	114	56
PT Fellowship	7	5	71	1	1	100
Ind Res Allow — ST	10	9	90	9	7	78
Ind Res Allow — FE	8	4	50	5	3	60
Scholar/Est Grant	45	27	60	33	17	52
Independent Est Grant	13	7	54	10	2	20
Clinical Fellowship	41	23	56	31	17	55
Clinical Investigator	—	—	—	6	1	17
Heritage Scientist	4	4	100	3	2	67
Major Equipment	217	117	54	110	46	42
Conference Grant	25	17	68	16	15	94
Visiting Professor	14	13	93	6	4	67
Visiting Sc to Alta	20	7	35	16	6	38
Visiting Sc from Alta	7	3	43	7	4	57
Technology Transfer I	—	—	—	—	—	—
Technology Transfer II	—	—	—	—	—	—
Professor in Residence	1	1	100	—	—	—
Clinical Traineeship	—	—	—	1	1	100

	1986	
APPLICATIONS RECEIVED	APPLICATIONS APPROVED	PERCENT APPROVED
157	65	41
4	2	50
287	176	61
158	81	51
6	4	67
16	11	69
5	2	40
38	19	50
10	4	40
31	17	55
7	4	58
2	1	50
57	28	49
4	4	100
7	7	100
9	5	56
5	2	40
10	2	20
7	4	57
—	—	—
—	—	—

Programs of the Foundation

Heritage Medical Scientist Awards

This award is designed to encourage the recruitment and establishment of senior medical scientists to Alberta. A Heritage Medical Scientist is a leader in his field and is internationally recognized for his scientific contributions.

Alberta investigators with a record of outstanding research, whose stipend from competitive funding agencies (MRC, NSERC, AHFMR, etc.) is scheduled to terminate are also eligible.

Scholarships

Alberta Heritage Medical Research Scholarships support investigators recently trained in medical research who have demonstrated promise and ability to initiate and conduct independent research. A five-year, renewable Scholarship allows scientists to develop medical research unhampered by heavy teaching and service duties.

Scholarships are granted by competition and based upon the excellence of the candidate, the originality and importance of the project, and the quality of the proposed research environment.

Clinical Investigatorships

Clinical Investigatorships give clinically qualified medical scientists holding full-time academic appointments further research training and experience assisted by competitively-funded basic or clinical researchers. Clinical investigators must have an M.D. or D.D.S., have completed clinical specialty training and two or three years of supervised medical research. The three-year award may be extended for two years but is not renewable.

Independent Establishment Grants for New Investigators

Heritage Medical Research Independent Establishment Grants are given to new investigators who are not funded by the Foundation (who may or may not hold an award from another research granting agency). This grant is designed to help new investigators quickly achieve maximal research productivity by providing equipment, technical assistance, materials and supplies.

Fellowships

Heritage Medical Research Fellowships provide qualified candidates with full-time post-graduate training in research in an area of medical science relevant to the aims of the Foundation. Fellows must have an M.D., D.D.S., D.V.M., Ph.D., or equivalent degree and must demonstrate high academic standing and evidence of research ability.

Clinical Fellowships

Clinical Fellowships give individuals who have completed clinical training an opportunity to gain supervised medical research experience. The applicant must have a medical or dental degree obtained within the last ten years and have completed subspecialty clinical training. The one year award may be renewed three times.

Studentships

The Foundation provides three types of awards: Full-time, Part-time, and Summer Studentships.

There are a limited number of Full-Time Studentships for students registered in full-time M.Sc. or Ph.D. programs, and who plan careers in medical research. The University must accept students into a graduate program and invite students to apply for an AHFMR Studentship. Studentships are granted by competition based on excellence.

A limited number of Part-Time Studentship awards are available to full-time students working towards professional health-related degrees. Research required by the curriculum is not eligible for support.

Summer Studentship awards support promising Alberta university students who wish to spend their summer months (May to August) engaged in medical research.

Research Allowances

(Independently Funded Students & Fellows)

Holders of full-time Studentships and Fellowships awarded by another research agency using similar guidelines and standards are eligible to apply to the Foundation for a Research Allowance.

Technology Transfer Grants

The Technology Transfer Program is designed to provide a unique opportunity for Alberta medical researchers or engineers to promote university/industrial collaboration in Alberta, stimulate technological innovation in Alberta, and advance medical research to the stage where private investors may provide seed capital.

Phase I grants enable applicants to strengthen the technical merit and explore the feasibility of a scientifically sound project.

Phase II grants apply when a product or technique has been identified and laboratory tested but requires further investigation and refinement to attract seed/venture capital.

Visiting Scientists

Awards for Visiting Scientists to Alberta enable a limited number of highly innovative and productive medical scientists to engage in medical research in an Alberta university for the purpose of bringing special knowledge and expertise to the host, department, group, or institution.

Awards for Visiting Scientists from Alberta enable Alberta medical scientists to undertake collaborative research which they are unable to undertake locally due to inadequate technology or collegial expertise. Research funded must be an obvious step in the progression of a sustained research effort on the part of the Visiting Scientist.

Conference Grants

The Foundation supports a limited number of conferences and workshops clearly related to the enhancement of medical research in Alberta and the transmission of significant new knowledge to those responsible for the management of patients.

Conference support is usually limited to the funding of a small number of distinguished medical scientists invited to participate as special lecturers or major participants. Funds also support a limited number of workshops on collaborative research and workshops which explore and evaluate new research findings.

Visiting Lecturers

The Visiting Lecturer program helps Alberta universities attract outstanding medical scientists who can broaden and enrich the educational experience of graduate students and fellows. The program also gives Alberta investigators, individually or in groups, the opportunity to discuss their research with other experts in their field of medical research.

Travel Grants

The Foundation annually gives Travel Grants to The University of Alberta and The University of Calgary to be administered by the Universities for the following purposes:

- Attendance of faculty members at workshops, conferences and annual meetings.
- Recruitment of researchers.
- Short visits to discuss complicated experimental design and cooperative research.
- Short visits to other laboratories to study new research techniques and to host external investigators who can assist in establishing new techniques.

Visiting Professors

Heritage Medical Research Visiting Professorships are available for the purpose of recognizing and attracting truly outstanding medical scientists to visit Alberta to enrich and enhance the climate of medical research within the universities and the affiliated institutions.

Grants for Major Equipment

Major Equipment grants permit the university on behalf of investigators to purchase equipment essential to high-quality research. Applications usually relate directly to research projects supported by competitive granting agencies.

Grants for Equipment Maintenance ensure adequate maintenance of major equipment wholly funded by the Foundation's Major Equipment Grants. Preference is given to expensive facilities providing support to groups of researchers and multidisciplinary projects, especially those facilities offering services to researchers with partial or full recovery arrangements for regular operating costs. ■

How are Scientists Selected for Grants?

Who decides who will receive Foundation grants and awards? As President Dr. Lionel McLeod explains below, funds are provided on the basis of the time-honoured peer review system in which established scientists in a designated field evaluate a proposal. Each proposal submitted to the Foundation is reviewed for merit by several scientists. Dr. McLeod describes the process.

Funding People, Not Targeted Projects

From the beginning the Foundation decided to fund very well-trained people who show considerable promise according to the best judgement of scientists in the field. We would not focus on an illness or a particular subject area because that has not worked well in the past. Consider the American experience. Because President Kennedy thought he could put a man on the moon, which he did very successfully, President Nixon thought he could shoot cancer, which he didn't do at all. The technology and basic understanding were there for the jump to the moon, but unfortunately the basic mechanisms were not well enough understood to conquer cancer. The Foundation decided to pursue good people with good ideas, rather than target research toward specific diseases.

Providing a Quality Environment

We set a priority on people and ideas. The second priority was to create an environment which would attract young people because we were making a 20 year investment. The third priority was to provide an environment that had the equipment, and technical back-up, to make it first-class.

At this point we have significant numbers of scientists in various disciplines who are attracting very bright young people from all over the continent and abroad. There is now a natural momentum in recruiting and in the productivity of scientists already in place.

Our only concern is that researchers remain on the frontiers of today's knowledge, that we not find them listlessly examining, and re-examining. How are we to maintain the momentum? Our greatest concern is not with specifics such as: Do we fund cancer studies or heart studies? Our concern is: How do we continue to support and attract more bright young people?

The Review Process

How do we chose people? Let's look at an application proposing studies in a specific field. We establish a committee of experienced, and competitively-funded scientists, half from Edmonton and half from Calgary. They examine the application and recommend to the administration: We think the following scientists are front and centre in this discipline so send this application to at least three of them and request a confidential written report.

The majority of these reviewers must be from outside Alberta. They are asked to judge: Does the applicant have the right kind of training to do the proposed research? Is the proposal likely to achieve important results? Are the costs reasonable? Is the proposal original and creative? Does the applicant's track record suggest he or she will be productive over a long period of time?

The written reports are then submitted to the original committee members who say: "Okay, we have the focused judgment of scientists within the candidate's discipline, now let's consider how the proposed applicant would fit into the broader picture of research development at the institution. Is this work likely to lead to an important contribution?"

If the answer is positive and there is agreement on the quality of the individual, the committee recommends the trustees fund the applicant. The Trustees then say "yes" or "no".

Renewals

Review for renewal is also important. Presently, a young person can plan a medical research career in Alberta. He or she can enter at the Scholar level for an initial five years, be renewed for a further five years, and then if studies are productive, apply for a Heritage Medical Scientist Award. This is a tougher hurdle because, though this award is also for a five-year renewable term, it is viewed as a longer-term commitment.

It's quite possible for a young Albertan to say: "I can see a full career, if I'm bright and work hard enough." ■

Personnel

Heritage Medical Scientists

Allen, Peter, Ph.D., Department of Applied Sciences in Medicine, Faculty of Medicine, University of Alberta "Imaging and Biochemical Applications of NMR to Medicine"

Davison, Joseph, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Nervous Control of Gastrointestinal Secretions"

Maloney, John, Ph.D., Departments of Obstetrics and Gynecology and Medical Physiology, Faculty of Medicine, University of Calgary "The Physiology and Development of the Fetus and Neonate"

McGhee, James, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "Gene Expression During Animal Development"

Paterson, Malcolm, Ph.D., Departments of Medicine and Biochemistry, Faculty of Medicine, University of Alberta "Clinical Genetics and Molecular Carcinogenesis"

Remmers, John, M.D., Departments of Medicine and Physiology, Faculty of Medicine, University of Calgary "Control of Breathing by the Nervous System"

Salmi, Aimo, M.D., Ph.D., Department of Medical Microbiology, Faculty of Medicine, University of Alberta "Immunopathogenesis of Neurovirological Diseases"

ter Keurs, Henk, M.D., Ph.D., Departments of Medicine and Medical Physiology, Faculty of Medicine, University of Calgary "Activation and Contraction of the Heart"

Tyberg, John, M.D., Ph.D., Departments of Medicine and Medical Physiology, Faculty of Medicine, University of Calgary "Cardiac Mechanics: Factors Affecting the Heart's Pumping Action"

Wang, Jerry, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "Studies in Cell Regulation"

Yoon, Ji-Won, Ph.D., Department of Microbiology and Infectious Diseases, Faculty of Medicine, University of Calgary "Two Possible Mechanisms for the Pathogenesis of Virus-Induced Diabetes Mellitus"

Heritage Medical Scholars

Anderson, M. John, Ph.D., Department of Pharmacology and Therapeutics, Faculty of Medicine, University of Calgary "Development of the Neuromuscular Junction"

Anderson, Robert, Ph.D., Department of Microbiology and Infectious Diseases, Faculty of Medicine, University of Calgary "Control of Virus Synthesis and Assembly"

Auer, Roland, Ph.D., M.D., Department of Pathology, Faculty of Medicine, University of Calgary "Neuronal Death in Ischemia, Hypoglycemia, and Epilepsy"

Bazett-Jones, David, Ph.D., Departments of Anatomy and Medical Biochemistry, Faculty of Medicine, University of Calgary "Ultrastructure of Transcription Complexes"

Befus, Dean, Ph.D., Department of Microbiology and Infectious Diseases, Faculty of Medicine, University of Calgary "Studies of Intestinal Immunity and Mast Cells"

Biddle, Fred, Ph.D., Departments of Pediatrics and Medical Biochemistry, Faculty of Medicine, University of Calgary "Genetic Studies of Threshold Traits of Mammalian Development"

Blasdel, Gary, Ph.D., Department of Anatomy, Faculty of Medicine, University of Calgary "Development of Thalamocortical Afferents"

Boisvert, Donald, Ph.D., M.D., Department of Surgery, Faculty of Medicine, University of Alberta "Pathophysiology and Therapy of Cerebrovascular Occlusion"

Bourne, Gregory, Ph.D., Department of Physiology, Faculty of Medicine, University of Alberta "The Regulation of Testicular GnRH Receptors and GnRH-Like Peptides and their roles in Steroidogenesis"

Bowling, Douglas, Ph.D., Departments of Medical Physiology and Anatomy, Faculty of Medicine, University of Calgary "Projections of Single Identified Retinal Axons"

Bulloch, Andrew, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Cellular Basis of Adult Neuronal Plasticity"

Carne, Thomas, Ph.D., Department of Chemistry, Faculty of Science, University of Calgary "Biosynthesis of Pituitary Hormones"

Clandinin, Michael, Ph.D., Department of Foods and Nutrition, Faculties of Home Economics and Medicine, University of Alberta "Nutrition and Metabolism of Dietary Fat"

Codding, Penelope, Ph.D., Departments of Chemistry and Pharmacology and Therapeutics, Faculties of Science and Medicine, University of Calgary "Molecular Structure and Function Studies of CNS Active Drugs and Toxins"

Danielson, Terry, Ph.D., Department of Pharmacy and Pharmaceutical Sciences, Faculty of Pharmacy, University of Alberta "Metabolism and Plasma Levels of Clinical Monoamine Oxidase Inhibitors"

Dasgupta, Mrinal, M.D., Department of Medicine, Faculty of Medicine, University of Alberta "MBP-Specific CIC in Multiple Sclerosis"

Delay, Michael, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "Excitation-Contraction Coupling in Muscle"

Duff, Henry, M.D., Department of Medicine, Faculty of Medicine, University of Calgary "Mechanistic Approach to Antiarrhythmic Therapy"

Eggermont, Jos, D.Sc., Department of Psychology, Faculty of Social Sciences, University of Calgary "Functional Plasticity of the Auditory Nervous System"

Famiglietti, Edward, M.D., Ph.D., Department of Anatomy, Faculty of Medicine, University of Calgary "Functional Architecture of Vertebrate Retina"

Field, Leigh, Ph.D., Department of Pediatrics, Faculty of Medicine, University of Calgary "The Genetics of Susceptibility to Insulin-Dependent Diabetes"

Ford, Gordon, M.D., Department of Internal Medicine, Faculty of Medicine, University of Calgary "Interdependence of the Lung, Ribcage and Diaphragm During Atelectasis"

Frank, Cyril, M.D., Department of Surgery, Faculty of Medicine, University of Calgary "Connective Tissue Structure and Function"

Fritzler, Marvin, Ph.D., M.D., Division of Rheumatology and Clinical Immunology, Faculty of Medicine, University of Calgary "Antinuclear Antibodies in Autoimmune Diseases"

Giles, Wayne, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Electrophysiology of Isolated Cardiac Cells"

Green, Douglas, Ph.D., Department of Immunology, Faculty of Medicine, University of Alberta "Immunoregulatory T Cells and Molecules"

Green, Francis, M.D., Ph.D., Department of Pathology, Faculty of Medicine, University of Calgary "Mechanisms of Lung Injury by Environmental Agents"

Greenshaw, Andrew, Ph.D., Department of Psychiatry, Faculty of Medicine, University of Alberta "Beta-Phenylethylamine, p-Tyramine and p-Octopamine and the Treatment of Affective Disorders"

Hangartner, Thomas, Ph.D., Department of Applied Sciences in Medicine, Faculty of Medicine, University of Alberta "Development of Methods to Diagnose and Treat Bone Disorders"

Hanley, David A., M.D., Department of Internal Medicine, Faculty of Medicine, University of Calgary "Studies of Parathyroid Hormone Physiology"

Hart, David, Ph.D., Department of Microbiology and Infectious Diseases, Faculty of Medicine, University of Calgary "Immunochemical Characterization of Plasminogen Activators"

Hicks, T. Philip, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Identification of Synaptic Transmitters in the Mammalian Visual and Somatosensory Systems"

Hindsgaul, Ole, Ph.D., Department of Chemistry, Faculty of Science, University of Alberta "Biological Recognition of Complex Carbohydrates"

Hoar, David, Ph.D., Departments of Medical Biochemistry and Pediatrics, Faculty of Medicine, University of Calgary "DNA Sequence Diversity in Man"

Hoffer, J. Andy, Ph.D., Departments of Medical Physiology and Clinical Neurosciences, Faculty of Medicine, University of Calgary "Neural Control of Movements"

Hulbert, William, Ph.D., Department of Medicine, Faculty of Medicine, University of Alberta "The Effect of H_2S on Airway Structure and Function"

Iatrou, Kostas, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "The Organization, Expression and Evolution of Eukaryotic Multigene Families in Chorion of Bombyx Mori"

Jarvis, Simon, Ph.D., Department of Physiology, Faculty of Medicine, University of Alberta "Molecular Properties and Regulation of the Nucleoside Transport System"

Jaworski, Martine, M.D., Department of Pediatrics, Faculty of Medicine, University of Alberta "Pathogenesis of Insulin Dependent Diabetes Mellitus"

Jensen, Susan, Ph.D., Department of Microbiology, Faculty of Science, University of Alberta "Biosynthesis of Novel Penicillin and Cephalosporin Antibiotics"

Kaufman, Susan, Ph.D., Department of Medicine, Faculty of Medicine, University of Alberta "Control Mechanisms of Fluid and Electrolyte Balance"

King, Malcolm, Ph.D., Department of Medicine, Faculty of Medicine, University of Alberta "Studies on Mucus Clearance"

Koopmans, Henry, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "The Internal Control of Food Intake"

Lau, David, M.D., Ph.D., Department of Medicine, Faculty of Medicine, University of Calgary "Regulation of Adipose Tissue Development and Growth"

Lee, Patrick, Ph.D., Department of Microbiology and Infectious Diseases, Faculty of Medicine, University of Calgary "The Mechanism of Virus Attachment of Host Cells"

Lefebvre, Yvonne, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "Passage of Steroid and Thyroid Hormones Across the Nuclear Envelope of Mammalian Cells"

Leung, Wai-Choi, Ph.D., Departments of Medicine and Medical Microbiology, Faculty of Medicine, University of Alberta "Molecular Cloning of Viral Neutralization Antigen and Human Tumor Antigen"

Lord, Catherine, Ph.D., Department of Pediatrics, Faculty of Medicine, University of Alberta "Sex Differences in Autism"

MacVicar, Brian, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Neuronal Basis for Synchrony During Seizure"

Mannoni, Patrice, M.D., Department of Pathology, Faculty of Medicine, University of Alberta "Antigen Characteristics of Hematopoietic Stem Cells"

Mantle, Michèle, Ph.D., Departments of Medical Biochemistry and Pediatrics, Faculty of Medicine, University of Calgary "Structure, Synthesis and Secretion of Intestinal Mucus"

Maranda, Bruno, Ph.D., Department of Surgery, Faculty of Medicine, University of Alberta "Immuno-Cytochemical Investigation of Axonal Transport"

Martin, Renée, Ph.D., Department of Pediatrics, Faculty of Medicine, University of Calgary "Cytogenetic Analysis of Human Sperm"

Matheson, David, M.D., Departments of Pediatrics and Internal Medicine, Faculty of Medicine, University of Calgary "Cellular Regulation of Immune Responses"

McFadden, Grant, Ph.D., Department of Biochemistry, Faculty of Medicine, University of Alberta "Molecular Biology of Tumorogenic Shope Fibroma Poxviruses"

McGarry, Ronald, Ph.D., Departments of Pediatrics and Pathology, Faculty of Medicine, University of Calgary "Functional Role of MAG"

Miller, Rodman, Ph.D., Department of Anatomy, Faculty of Medicine, University of Calgary "Freeze Fracture Localization of Antigens and of Cholesterol"

Milos, Nadine, Ph.D., Department of Anatomy, Faculty of Medicine, University of Alberta "Factors Controlling Pattern Formation by Neural Crest Cells"

Minuk, Gerald, M.D., Department of Medicine, Faculty of Medicine, University of Calgary "Role of GABA in Liver Disease"

Moore, Graham, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "The Synthesis and Evaluation of Peptide Hormones and Analogues"

Mortimer, David, Ph.D., Department of Obstetrics and Gynecology, Faculty of Medicine, University of Calgary "Human Sperm Physiology and Infertility"

Northup, John, Ph.D., Department of Pharmacology and Therapeutics, Faculty of Medicine, University of Calgary "GTP Binding Proteins and Adenylate Cyclase"

Palcic, Monica, Ph.D., Department of Food Science, Faculty of Agriculture/Forestry, University of Alberta "Enzyme Inhibitors as Therapeutic Agents"

Parhad, Irma, M.D., Departments of Pathology and Clinical Neurosciences, Faculty of Medicine, University of Calgary "Neurofibrillary Degeneration: Pathogenic Mechanisms"

Parsons, Howard, M.D., Department of Pediatrics, Faculty of Medicine, University of Calgary "Energy Expenditure and Fatty Acid Metabolism"

Pittman, Quentin, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Peptide Neurotransmission in Brain"

Preiksaitis, Jutta, M.D., Department of Medicine, Faculty of Medicine, University of Alberta "Transfusion Acquired Cytomegalovirus Infection: Epidemiology and Immune Response in Man"

Quandt, Fred, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Electrical Properties of Isolated Retinal Neurons"

Ramcharan, Savitri, M.D., Ph.D., Department of Community Health Sciences, Faculty of Medicine, University of Calgary "Epidemiologic Studies of the Menstrual Cycle and PMS"

Rattner, Jerome, Ph.D., Departments of Medical Biochemistry and Anatomy, Faculty of Medicine, University of Calgary "High Order Structure of Chromosomes"

Reh, Thomas, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Regeneration of Optic Nerve"

Reha-Krantz, Linda, Ph.D., Department of Genetics, Faculty of Science, University of Alberta "The Biochemical Basis of Mutation"

Reithmeier, Reinhart, Ph.D., Department of Biochemistry, Faculty of Medicine, University of Alberta "Structure and Function of Membrane Proteins"

Reynolds, John, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Studies of the Intestinal Immune System"

Rorstad, Otto, M.D., Ph.D., Department of Medicine, Faculty of Medicine, University of Calgary "Mechanisms of Action of Brain Peptides"

Schneider, Wolfgang, Ph.D., Department of Biochemistry, Faculty of Medicine, University of Alberta "Receptor-Mediated Endocytosis in Oocytes"

Schürch, Samuel, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Lung Stability and Cell Adhesion"

Severson, David, Ph.D., Department of Pharmacology and Therapeutics, Faculty of Medicine, University of Calgary "Lipid Metabolism in Heart and Blood Vessels"

Singh, Bhagirath, Ph.D., Department of Immunology, Faculty of Medicine, University of Alberta "Mechanism and Regulation of Antigen Recognition by T-Lymphocytes"

Smith, Peter, Ph.D., Department of Pharmacology, Faculty of Medicine, University of Alberta "Electrophysiological Studies of the Electrogenic Sodium Pump in Sympathetic Ganglia and Spinal Cord"

Snyder, Floyd, Ph.D., Departments of Medical Biochemistry and Pediatrics, Faculty of Medicine, University of Calgary "Studies of Inherited Disorders of Nucleotide Metabolism"

Sokol, Pamela, Ph.D., Department of Microbiology and Infectious Diseases, Faculty of Medicine, University of Calgary "Role of Iron in the Pathology of Pseudomonas Infection"

Stockbridge, Norman, M.D., Ph.D., Department of Surgery, Faculty of Medicine, University of Alberta "Signal Processing by Neurons"

Taylor, Diane, Ph.D., Department of Medical Microbiology, Faculty of Medicine, University of Alberta "Characterization of Bacterial Plasmids"

Tyler, Jonathan, Ph.D., Department of Genetics, Faculty of Science, University of Alberta "Structure and Function of Biological Membranes"

Vogel, Hans, Ph.D., Department of Chemistry, Faculties of Medicine and Science, University of Calgary "NMR Studies of Mechanistic and Regulatory Aspects of Metabolism"

Waisman, David, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "Studies of Calcium Binding Proteins"

Walsh, Michael, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "Enzyme Regulation by Calcium"

Wenman, Wanda, M.D., Department of

Pediatrics, Faculty of Medicine, University of Alberta "Human Infections with Chlamydia Trachomatis"

Witkowski, Francis, M.D., Department of Medicine, Faculty of Medicine, University of Alberta "Autonomic Neural Influences in Arrhythmogenesis"

Woods, Donald, Ph.D., Department of Microbiology & Infectious Diseases, Faculty of Medicine, University of Calgary "Pathogenesis of Pseudomonas Aeruginosa Disease"

Wyse, George, Ph.D., M.D., Departments of Medicine and Pharmacology, Faculty of Medicine, University of Calgary "Investigations in Hypertension and Electrophysiology"

Heritage Clinical Investigators

Beauchene, James, M.D., Department of Surgery, Faculty of Medicine, University of Alberta "Biological Basis of Therapeutic Tissue Expansion"

Gill, M. John, M.D., Department of Microbiology and Infectious Diseases, Faculty of Medicine, University of Calgary "Investigations of Viral Pathogenesis"

MacLean, Grant, M.D., Department of Medicine, Faculty of Medicine, University of Alberta "Monoclonal Antibodies in Small Cell Lung Cancer"

Ryan, Edmond, M.D., Department of Medicine, Faculty of Medicine, University of Alberta "Insulin Resistance in Pregnancy"

Scott, Brent, M.D., Department of Pediatrics, Faculty of Medicine, University of Calgary "Gastrointestinal Motor Function"

Warnock, Garth, M.D., Department of Surgery, Faculty of Medicine, University of Alberta "Transplantation of Human Islets of Langerhans"■

Dr. Jim Beauchene

The International Board of Review Report (Highlights)

The Board

The Act of Legislature which established the Alberta Heritage Foundation for Medical Research in 1979 stipulates that an International Board of Review will review the activities of the Foundation every six years. Members are to be nominated by the Scientific Advisory Council and appointed by the Trustees of the Foundation.

In this way the following were appointed to the International Board of Review in December 1985.

Chairman: Dr. J.C. Laidlaw (formerly Dean, Faculty of Health Sciences, McMaster University and Scientific Advisor to the President of the Medical Research Council) currently Executive Director (Medical Affairs), Canadian Cancer Society, Toronto.
Dr. Andre Archambault, Professor, Health and Pharmacy Administration, University of Montreal;
Dr. Robert Berliner (formerly Dean, Yale Medical School) currently Director, PEW Program, Yale University School of Medicine, New Haven, Connecticut;
Dr. Maxwell Cowan, (formerly Vice-President, Salk Institute for Biological Studies) currently Provost, Washington University, St. Louis;
Prof. H.J. Evans, Director, MRC Clinical and Population Cytogenetics Unit, University of Edinburgh;
Dr. Edwin G. Krebs, Senior Investigator, Howard Hughes Medical Institute, University of Washington Medical School, Seattle, Washington;
Dr. Robert B. Salter, Professor and Head, Orthopedic Surgery, The Hospital for Sick Children, Toronto;

These men reviewed the Grants and Awards program to assess how well the Foundation is meeting its objectives established by the Act:

1. to stimulate research in the medical sciences;
2. to implement ways to effectively use the scientific resources available in Alberta;
3. to support medical research laboratories and related facilities in the province;
4. to promote cooperation so that duplication is minimized and to promote concentration of efforts;
5. to encourage young Albertans to pursue medical research careers.

The Board of Review presented their report to the Trustees in November 1986. The following pages contain a summary of the report. Review board members were asked to comment on the impact and effectiveness of the present program and recommend modifications or new programs if necessary.

Five Programs Judged Impressive

Dr. Jack Laidlaw, Chairman of the Board, comments on the findings of the Board.

"In commenting on the programs during the period 1980 to 86, five very impressive programs have been launched; the personnel establishment grants, training programs, research support/infrastructure, technology transfer and the Heritage Medical Research Buildings to house new multidisciplinary bench to bedside groups. The impact of these five programs on medical research in Alberta, and indeed outside Alberta, has been both remarkable and unique. Over 100 highly trained Heritage Medical Scholars and Clinical Investigators have been recruited to the two Faculties of Medicine. 20% of the full time faculty of the two medical schools now consists of new Heritage appointees. Over half of these have come from outside Alberta. The attraction has been based on the opportunity to collaborate with first class scientists in many disciplines, the preservation of research time, the availability of establishment grants and the ability of the research training programs to attract first rate graduate and postdoctoral students. The high calibre of these investigators is illustrated by their superior record in obtaining operating grant support from national granting agencies.

"Over 70% of the students have taken their previous training outside of Alberta. The record of the graduates of these programs in pursuing further training and obtaining academic positions is impressive.

"Without the two new buildings at the U of A and U of C the development of new multidisciplinary research groups would be difficult if not impossible. Such groups must be established if Alberta is to be at the forefront of medical research....

"Faculties other than Medicine have benefited....

"In summary, these programs have produced a unique medical research milieu that is likely not matched elsewhere in the world. If their genes, training, and determination are right, the investigators and students can flourish in a very special way. There is no question, too, that international recognition of The Universities of Calgary and Alberta has been greatly enhanced by the Foundation's programs. Heritage Medical Scientists, Clinical Investigators and Scholars each have a major impact on undergraduate and postgraduate education. Patient care has also benefited. The research of a number of these investigators is beginning to have an impact on the prevention, diagnosis and treatment of disease.

Recommendations

"No new programs are recommended but we urge that Council take a more active role in developing new initiatives. There are a series of recommendations on a number of issues. There are two major recommendations. The first concerns the maintenance of vigour, innovation and excellence. We believe strongly that the future success of the Foundation is critically dependent on continued self renewal by the addition of new, young investigators to the Scientist, Scholar and Clinical Investigator programs.

"On the endowment of the Foundation, we strongly support the Foundation's plans for a steady state group of 200 Scientists, Scholars and Clinical Investigators with the necessary training and support.

"In our view the arms-length relationship of the Foundation to government has been a very important factor in its success. This relationship should be maintained."

Recruitment of Scientists

In summary, 109 AHFMR Scientists, Scholars and Clinical Investigators have been appointed over the six year period, 98 of these in the Faculties of Medicine. As an indication of the potential impact of these programs, during 1985-86 33 (14%) of the 250 full-time equivalent faculty of The University of Alberta Faculty of

Medicine were Heritage Scientists, Scholars or Clinical Investigators. The comparable figure for The University of Calgary Faculty of Medicine is 65 (27%) of the 240 full-time equivalent faculty.

It is of interest to note that over one half of the 109 Scientists, Scholars and Clinical Investigators have been attracted to Alberta from outside: 24 Americans from U.S. universities, 16 investigators from other countries (10 of these from the United Kingdom, Australia or New Zealand) and 19 Canadians from universities in other parts of Canada. In addition, 11 former Albertans were returned to the Province and 19 individuals (either in training or on limited funding) were retained in Alberta by the availability of the programs of the Foundation.

IBR REPORT

Grant Money Attracted to Alberta by AHFMR Personnel

An important component of the Personnel Establishment Programs is the *Establishment Grant.* This provides support for research operating expenses and major equipment for a period of two to three years. After this period, the investigator is expected to obtain such support from other agencies, e.g., the Medical Research Council, the National Cancer Institute, the Canadian Heart Foundation, etc. All of the Heritage Scientists (11) and Clinical Investigators (6) and almost all of the 92 Heritage Scholars have received Establishment Grants. All (8) of the Scientists and 70 of the 75 Scholars who have completed their first two to three years while on an Establishment Grant have obtained operating support from Canadian national research agencies with high quality peer review systems. It is important to note that this record is much more impressive than that of other first applicants to these agencies. It is common for only 30 per cent of the latter applicants to be awarded operating grants. This record of AHFMR-supported investigators is a remarkable testament to their quality and to the quality of their research programs.

IBR REPORT

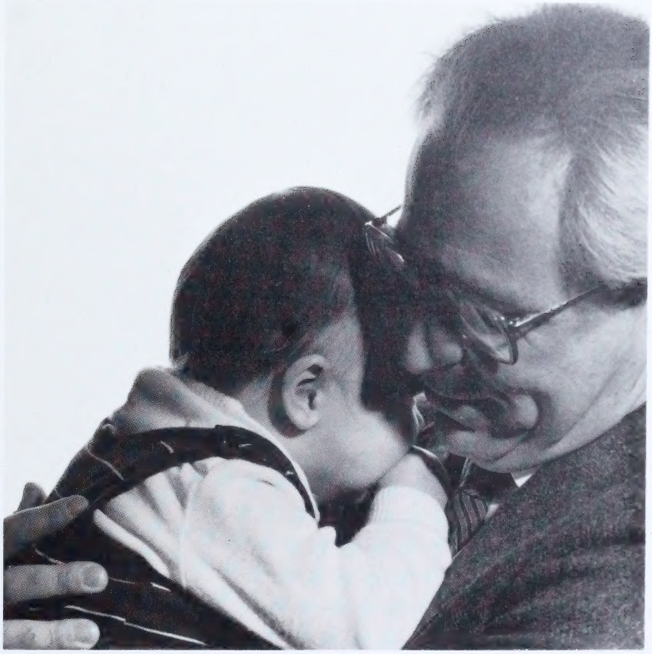
"I think the unusually generous support provided by the Foundation is likely to make this in the foreseeable future one of the most attractive places to do research in Canada. It is unusually generous in two very critical ways. 1) At the Scholars level, these people at the start of their careers have a sufficiently long period of time in which to do something significant. Offering them five years from the very beginning, and knowing they will be closely monitored without the expectation that they will have to produce a lot of trivial papers in the first few years, allows them good research opportunity. 2) It is unusually generous in that it provides for the young scientist to get substantial pieces of equipment. This is unique. Almost nowhere else I know of, with the exception of the Max Planck Institute in Germany, do young scientists have this tremendous opportunity. I think as word of this gets around you will have no difficulty in recruiting the bright young scientists, most of whom are not worried about tenure but are confident in their own ability and just want an opportunity to get to work. All of us know that our continuing support is dependent on productivity."

DR. MAXWELL COWAN
IBR MEMBER

"There is tremendous lead time in the very, very important years. It would take one of my people about two years to get to the point where a Heritage Scholar gets in six months."

DR. EDWIN KREBS
IBR MEMBER

A complete copy of the International Review Board Report is published in Part II of this Triennial Report.



The Alberta Heritage
Foundation for
Medical Research
3125 ManuLife Place
10180 - 101 Street
Edmonton, Alberta T5J 3S4
(403) 423-5727

Writer: Lois Hammond
Designer: Warren Clark, GDL
Photographer: Leslie Wagner